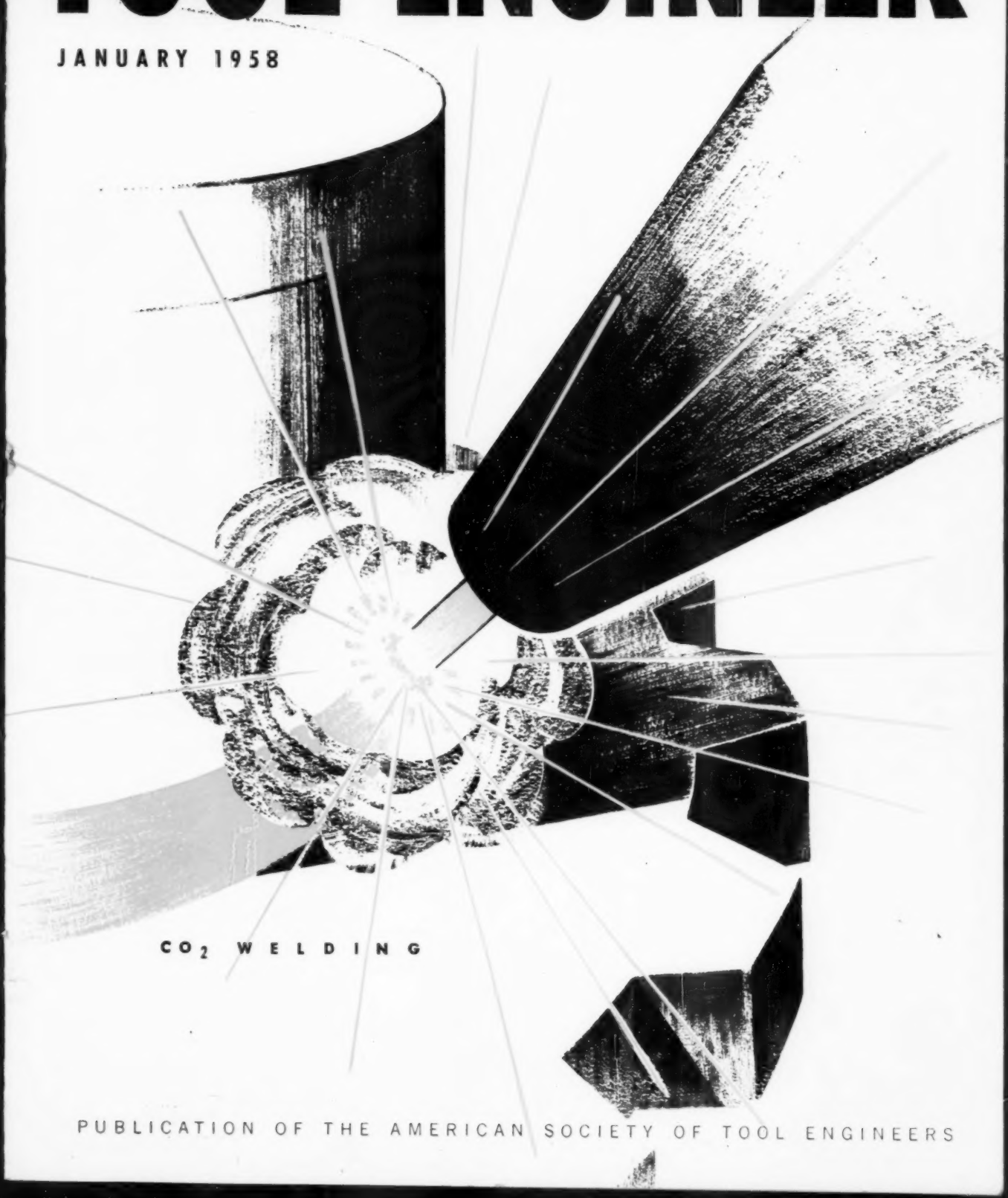
the TOOL ENGINEER

JANUARY 1958

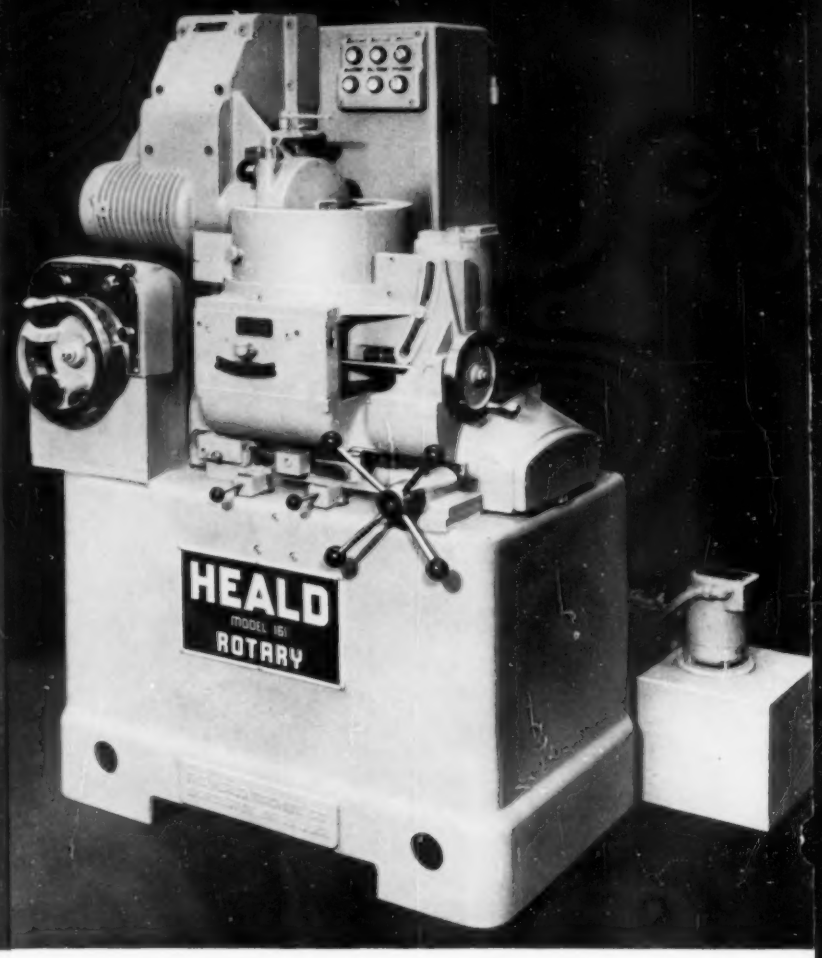


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the tool engineer

January 1958
Volume 40, No. 1

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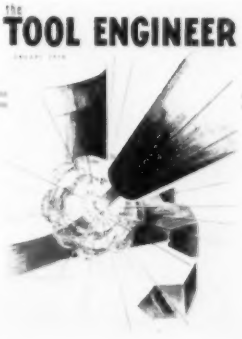
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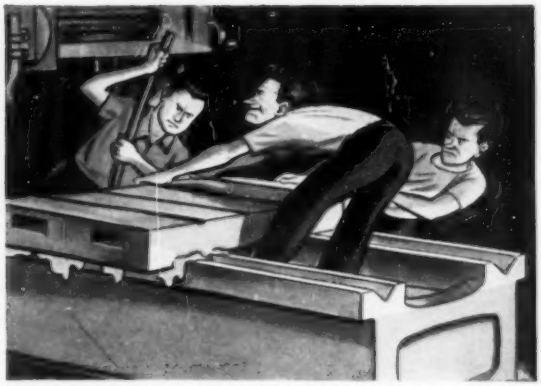


COVER: Shielding an arc with gas, rather than with a granular flux, makes the weld zone visible to the operator. Welding speeds are high, providing for economical joining. Details are given in an article starting on page 82.

THE TOOL ENGINEER is regularly indexed in the *Engineering Index Service* and *Industrial Arts Index*

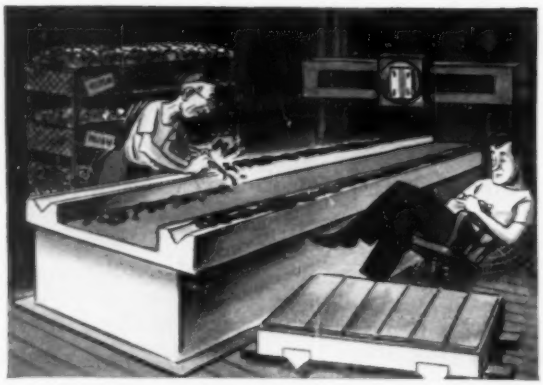


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Electronic Computers vs. the Slip Stick

Although the slide rule is generally regarded as the symbol of engineers, it is often useless for the precision required today. Many calculations, however, are still performed with crude materials ranging from pencil-and-paper through slide rules to nomograms and desk calculators. In many instances no real calculations are done at all; the engineer sizes up the situation and makes recommendations based upon similar situations experienced in the past. Many of the oldtimers can produce a print with the same finesse that Grandmother used when adding a pinch of salt to her cake.

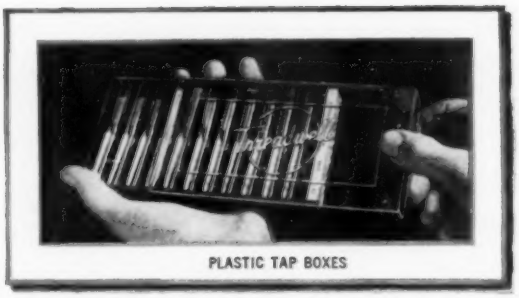
Much of the technical progress we enjoy today was derived from the genius of such designers, many of whom turned out the required pieces in the shop without benefit of prints or standards.

With the tremendous surge toward precision required by satellite launchings and missile control, the ancient toolmaking processes become inadequate. Surrounding us we now see precise formulas for all aspects of manufactured products. Calculations based on these precise formulas would be highly tedious on nonelectronic equipment but, once the formulas are programmed, electronic computers quickly perform the arithmetic necessary.

For certain rough approximations and for on-the-spot trouble shooting, electronic computers will never replace the slide rule. Also, small shops, whose volume of mathematical work cannot justify the acquisition of electronic equipment, will continue to use present calculation methods. Within a few years, however, the bulk of the numerical work of larger companies will be handled electronically. In preparation for that day, precise formulas are being derived and programmed. Also, basic handbook manipulations are being written in computer language. These will free the tool engineer from tedious calculations, giving him time for more creative work.

John W Greve

EDITOR



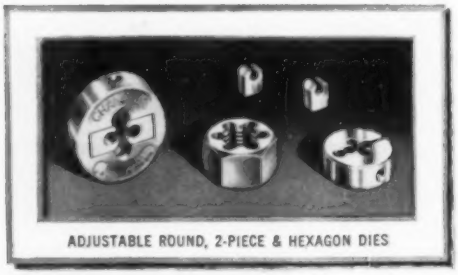
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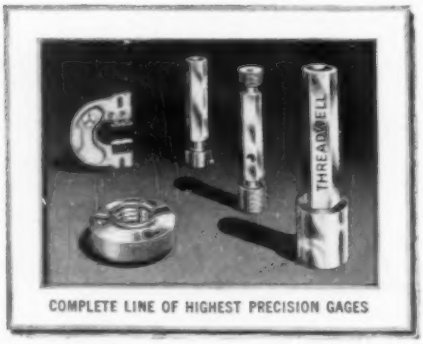
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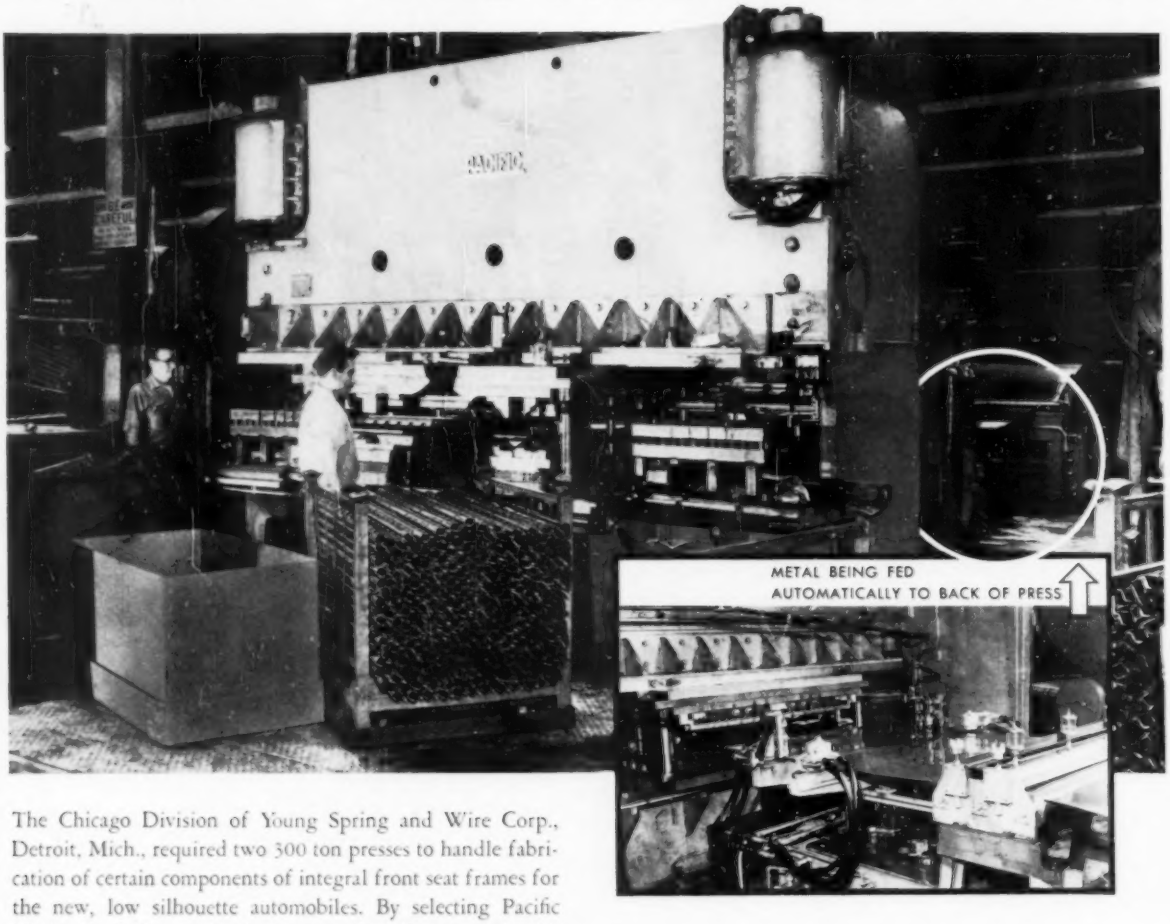
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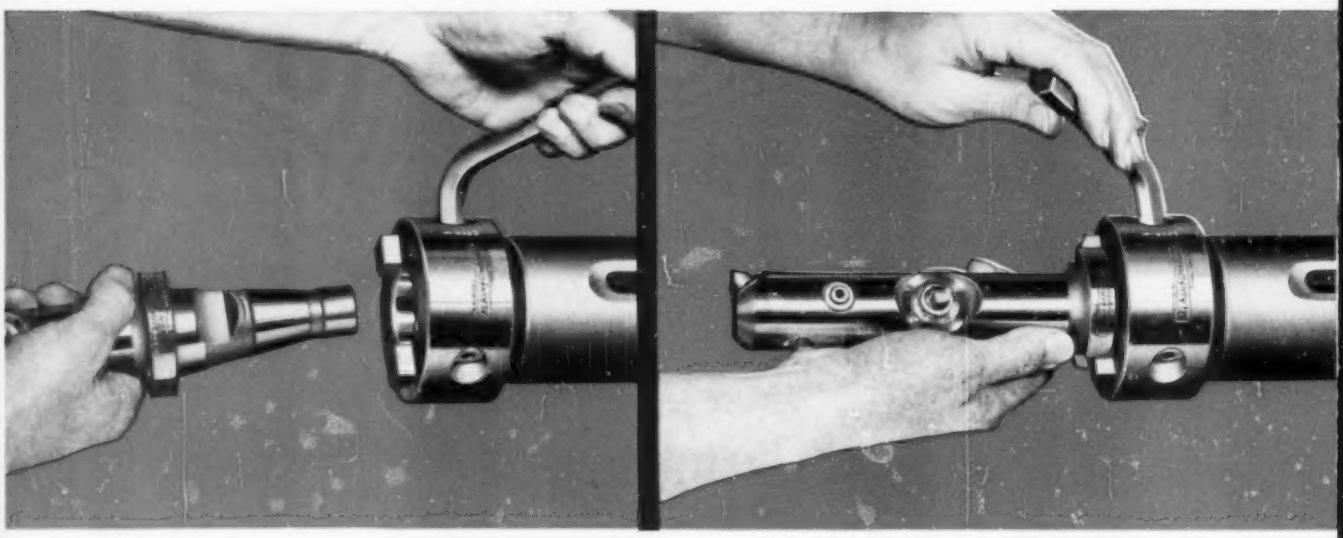
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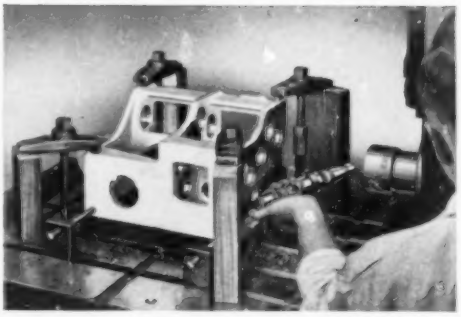
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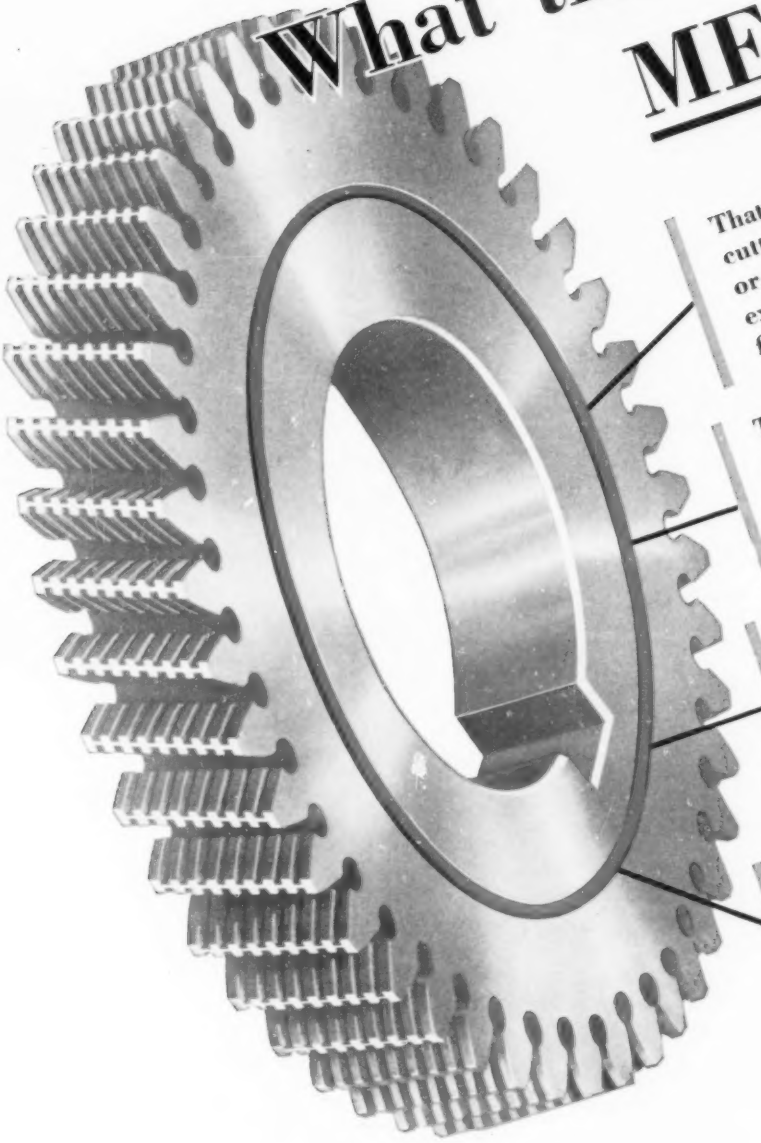
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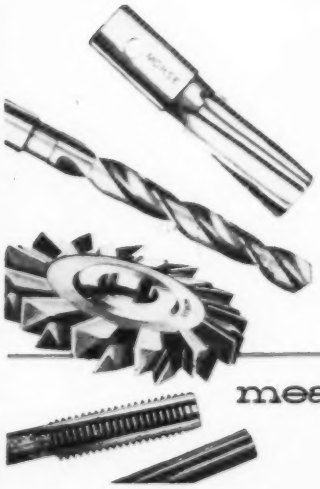
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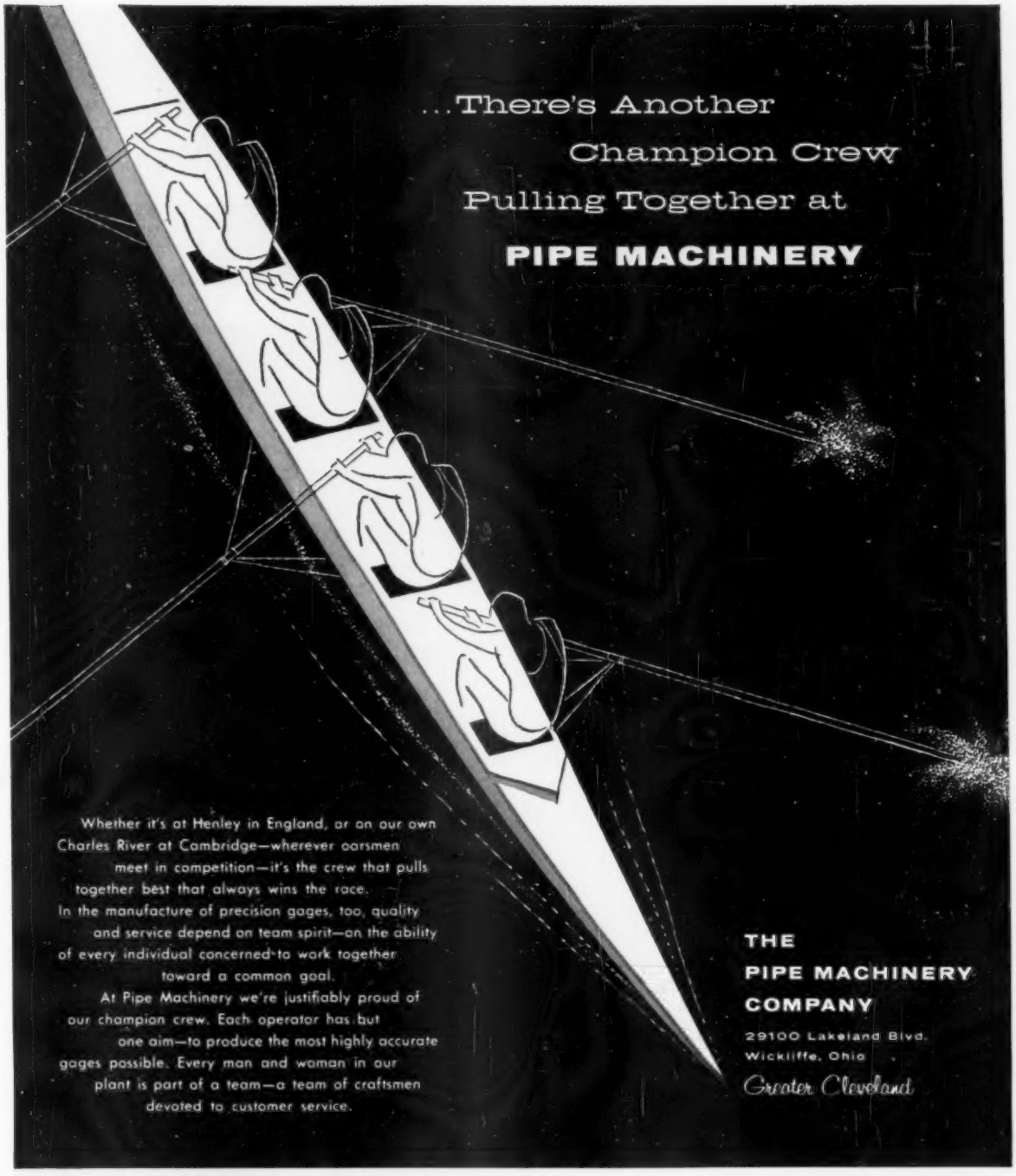
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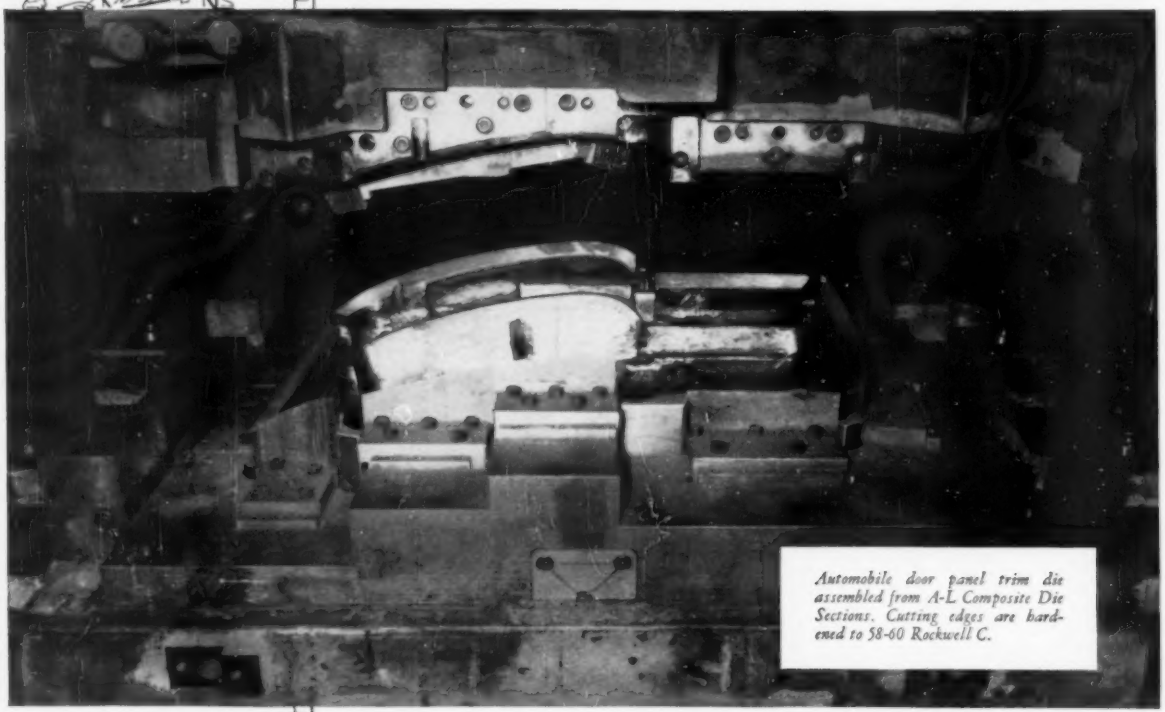
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Station 2—semi-finish-turn B, finish-turn D, semi-finish-bore H and chamfer G.

Station 3—finish-turn B.

Station 4—finish-face J with internal facing slide tool, actuated by pusher rod contacting positive stop mounted on headstock.

Station 5—finish-shave-turn C, break sharp corner at E with turret-facing slide tool operated by pusher arm on rear cross slide.

Station 6—finish-bore H (tool dwells in bore as spindle stops, then withdraws to eliminate spiral toolmarks).

A-F is rough- and finish-faced by rear and front cross-slide tools, operating with stations 1 and 2. Three spindle speed changes and three feed changes during automatic cycle assure longer tool life, finer finish on each cut. F.t.f. time? Only 6.75 minutes!

For the second operation, work is chucked on D and located at A. Here's the sequence, handled by hexagon turret tools:

Station 1—rough-shave-face M and rough N.

Station 2—operates front and rear cross slides simultaneously to rough- and finish-face R.

Station 3—idle turret.

Station 4—finish-face M and rough-form N, using turret-facing slide tool operated by pusher arm on rear cross slide.

Station 5—semi-finish-bore N, chamfer L-P.

Station 6—finish-bore N, holding within .001".

Floor-to-floor time on the second operation is a fast 2.75 minutes.

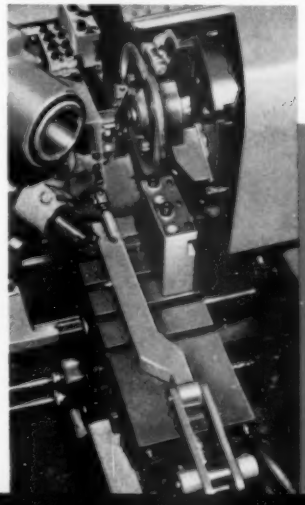
Automatic cycle on Fastermatic cuts previous time 25%. One operator handles both machines. Concentricity held to .0015" between chucking diameters on both sides of parts. Automatic feed and speed changes assure correct surface speeds on all machining operations.

Ask for new Fastermatic Catalog 1201.



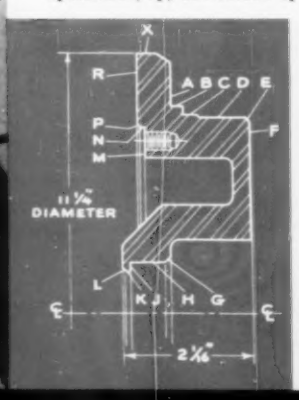


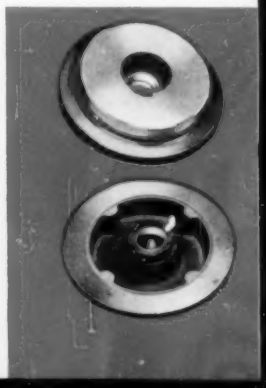
▲ First operation tooling setup. Note facing slide tool in foreground, operated by pusher rod on rear cross slide. Internal facing slide tool at far right.



◀ Rear overhead view of pusher-rod-operated turret facing slide tool used in second operation. Drawing indicates surfaces machined in both operations.

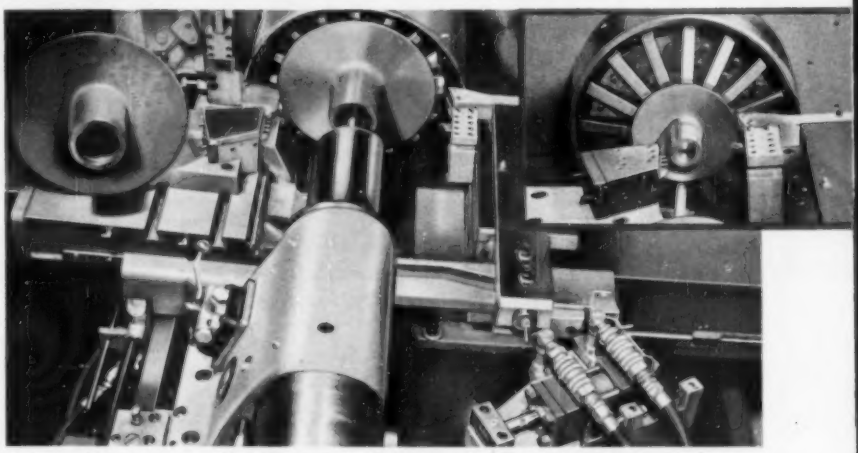
Finished workpieces, showing surfaces machined in first operation (top) and second operation (bottom). ▼





LEWELLEN MANUFACTURING COMPANY TRIMS TIME 53% ON PULLEYS

Assures accuracy with special chuck and cam-operated slide



▲ 10"-diameter pulley disc after rough-machining. Note taper-facing cam on rear independent slide; air-operated tool relief arrangement. Inset: 6"-diameter outer pulley disc, showing special chuck in close-up, gripping on small portion of O.D. edge.

Here's an operation worth reading about! It reveals how Lewellen Manufacturing Company, Columbus, Ind., cut machining time 53% on cast iron pulley discs, used in their extensive line of variable-speed motor pulleys.

A Gisholt MASTERLINE No. 12 Automatic Production Lathe handles 15 different part sizes, machined in lots of 50 to 100 pieces. All parts in a lot are rough-machined; tools are replaced, and the lot is finished. The fast setup on the No. 12 makes this operation economical, using similar tooling setups requiring only minor tool changes and cam adjustments for three basic part types—inner and outer pulley discs, and adjustable outer pulley discs.

Here's the operation on a 10"-diameter inner pulley disc (illustrated). The part slips on an expanding mandrel, extending from a 16-jaw, manually operated chuck. A large number of jaws are required to hold the part on a small portion of the O.D. to permit machining the tapered face past the O.D. edge. The part gets additional support from a revolving center on an air-operated tailstock which expands the end of the mandrel. This arrangement permits higher speeds and feeds and improves accuracy.



Two tools on the front carriage rough-turn the hub O.D., and a third tool forms a radius at the base. Simultaneously, a tool in a cam-operated sliding tool holder, on the rear independent slide, taper-faces the flange. An air cylinder shifts the cam for tool relief. The end of the hub is faced by a second tool on an adjustable tool block, completing the job in just 2.2 minutes floor-to-floor time.

Special chuck and support at hub end improve accuracy. Hub O.D. held within .0005". All taper angles handled by one cam with 30° adjustment. Quick-disconnect fittings are reversed to provide tool relief in opposite direction when changing from inner to outer pulley discs.

HOW GALE PRODUCTS CHECKS BALANCE ON FLYWHEELS

DYNETRIC BALANCERS GISHOLT

Assures product quality by checking wide variety of high-speed flywheels with 1S Balancer



Workpiece on supporting arbor. Manually operated breech-lock nut prevents slipping. Correction made by drilling on outer rim.

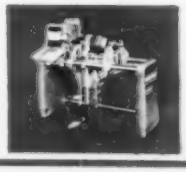
Like other alert manufacturers, Gale Products Division of Outboard Marine Corporation, Galesburg, Ill., knows accurate balancing of high-speed parts is critically important.

To make sure of long service life from their well-known line of outboard marine engines, Gale recently installed a Gisholt DYNETRIC 1S Balancer to balance flywheels used by the Corporation. Typical are the flywheels shown above, balanced on the Gisholt 1S to remove all sources of poss.ble vibration.

A similar setup is used to handle all parts. Because the flywheels have no arbors or shafts, a supporting arbor with an angularly graduated pulley is used. This saves considerable time since the operator can quickly slip the workpiece on the tapered right end of the arbor. A keyway drives the part, which is held during rotation by a manually tightened breech-lock nut.

Depending on the part, the 1S is easily set up for either two-plane or single-plane balancing, which includes a check for moment unbalance in the part. Chance of error is minimized since the 1S permits observation of angle and amount of unbalance in the same visual plane, and the amount meter is calibrated in terms of the method of correction used—in this case, drill depth. These parts can be handled in less than one minute floor-to-floor time on a production basis—including time for correction.

Close tolerances are easily held to this manufacturer's rigid specifications. Locating and reading unbalance amount and angle on parts held outside of the work supports simplifies loading and unloading without affecting accuracy.



GISHOLT

LOOK AHEAD... KEEP AHEAD... WITH GISHOLT

COMBINES BORING AND SUPERFINISHING IN AUTOMATIC CYCLE

MASTERLINE GISHOLT SINCE 1887

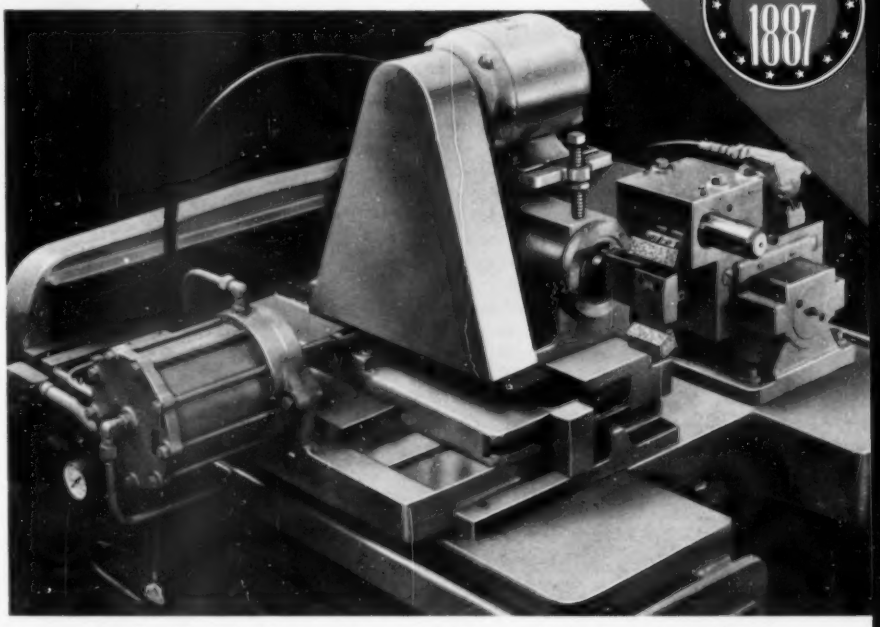
2-in-1 operation on Simplimatic saves time, cuts brake drum finishing costs

In studying this setup, you'll understand how many manufacturers have saved the cost of special equipment by using the versatile Simplimatic. Here's a typical example of the flexibility offered by this machine.

The workpiece, a 13⅝"-diameter cast iron brake drum, has been previously machined, leaving only the final finishing of the braking surface for this operation.

Note how simple the tooling is. The front independent slide carries a boring bar to finish the 2¹³⁄₁₆"-deep bore of the braking surface in the drum. An air-operated arrangement rotates the boring bar slightly, providing necessary tool relief to eliminate tool tracks.

As the boring operation is completed, an air cylinder moves the Superfinishing attachment, mounted on a special rear-slide base, into working position. At this point, the spindle speed decreases and the Superfinishing stones contact the machined surface. Within seconds this surface is reduced from 150-200 to 15 micro-inches RMS. The Superfinishing attachment then returns to starting position and the boring slide retracts as the platen table reverse-traverses, clearing the work for unloading. Total floor-to-floor time is a fast 3.5 minutes.



Close-up of tooling. Superfinishing attachment on special rear-slide base permits completing two operations in single handling.



Simplimatic's platen table permits infinite number of tooling arrangements using standard slides and simple attachments. Here machining and Superfinishing are combined to save time, extra handling and secondary operations on other equipment.

Ask for new Simplimatic Cat. 1159-C.

HANDLES 300 PARTS ON ONE MACHINE WITH JETracer

JETracer on MASTERLINE No. 4 Ram simplifies operation, improves accuracy

Here's how a well-known manufacturer of drive line components gets even more flexibility from the Ram Type Turret Lathe—by installing a tracing unit to handle stepped shafts and difficult contours. Nearly 300 parts are handled in job lots with the one machine.

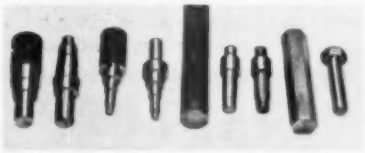
Other equipment includes a hydraulically operated collet chuck, pneumatic bar feed, a turret threading attachment with selective gear box and rapid traverse to the cross slide for faster operation.

This stepped shaft (shown at left) is a typical part, completed in two operations from 2" steel bar stock. Fed through the spindle, the material is located against a stock-stop on the first station and chucked on the O.D. in the collet chuck. Front square turret tools face the end, chamfer the outside edge. Tools on hexagon turret stations 3 and 4 rough-turn two diameters. Then a single-point tool on the JETracer at the rear of the cross slide generates all steps, blends and radii. The part is cut off from the front tool post. Floor-to-floor time, just 2.75 minutes.

No tooling is removed for the second operation. Cutting tools are reset, stops relocated, and the template replaced. The 6½"-long part is located against the stock-stop, and held on the machined O.D. Front square turret tools face and chamfer. Stock reducing tools on two hex turret stations rough two diameters. The JETracer completes the part. F.t.f. time is only 2.20 minutes.

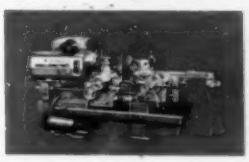


▲ First operation tooling on steel shaft. Note simple hexagon and square turret tooling. JETracer handles complex part of operation.



Group of representative parts, handled with similar setups. Stepped shaft at left. ▶

Ram Type Turret Lathe with JETracer offers choice of single-point tracing, multiple turret tooling, or a combination of the two. Saves time, provides maximum accuracy. Ideal for wide variety of parts since flat templates require minimum storage space.



TALK TO GISHOLT ABOUT MACHINE TOOL LEASING

GISHOLT

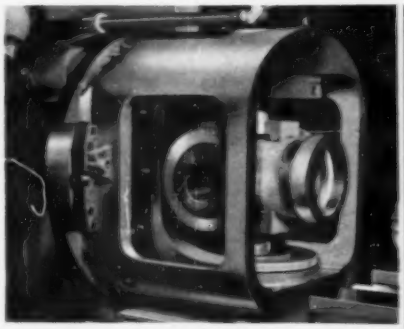
WALWORTH REDUCES TIME 30% ON 11 PART VALVE SIZES

Minimizes scrap with 8-position indexing fixture on 3L Saddle

Having problems on parts requiring indexing of work and completion of machining in one chucking? Then you'll want to study this setup. It shows how Walworth Company's East St. Louis, Ill., valve manufacturing plant is saving time and reducing scrap with a special indexing fixture on a MASTERLINE 3L Saddle Type Turret Lathe—with a gapped bed providing 42″ swing. The fixture has four 90° indexes, with a 7½° and an 11° index both left and right of the centerline.

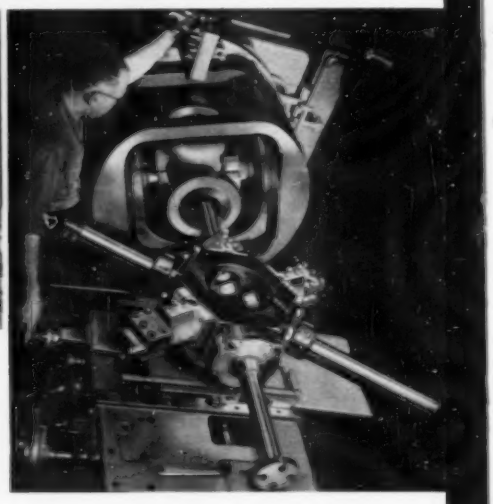
With minimum change-over, the setup shown handles over 11 different sizes of cast steel 2″ to 6″ straight pipeline valves, plus 2″ to 8″ swing check valves. Also, angular machining and seating operations are handled on a 10″ swing check valve. The same fixture handles all parts, with false jaws and riser plates compensating for size changes.





▲ Close-up of indexing fixture with 6″ valve body in position. Note movable overhead control panel.

Standard tooling on cross-feeding hex turret performs cross-facing, straight- and angle-boring and recessing plus threading operations. Note friction-type driver for screwing-in seat rings 5″ or smaller in diameter.



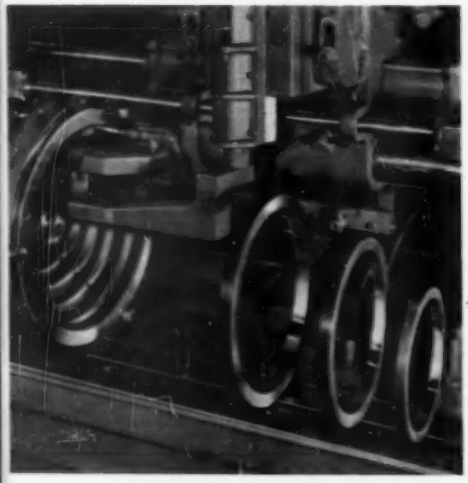
Performing all machining from the cross-feeding hexagon turret permits use of standard boring bars and facing tools for cross-facing and recessing operations. Each end of the valve is faced, bored, threaded—using a turret threading attachment—and undercut as required. Brass seat rings are screwed in with a turret-mounted friction-type driver. The driving lugs on the rings are bored out to complete the job.

A movable overhead control panel lets the operator be close to the work while starting, stopping, inching and reversing the spindle. Accurate depth of cut is assured by a reverse-feed stop bracket on the turret carriage. Longitudinal feed dials simplify length settings for facing operations. F.t.f. time on the 6″ valve shown is just 83.3 minutes.

Direct loading of work into fixture saves time. Up to 27 surfaces are machined on some parts. Eight index positions permit completing all work in one chucking.

CLEVELAND WORM AND GEAR CO. CUTS FINISHING TIME 30%

Superfinishes I.D.'s 30% faster with swinging stone holder on 51A Superfinisher



▲ Special faceplate fixture shows largest diameter ball ring in place. Three other sizes handled shown at right.

Here's a job story to save for future reference on finishing of straight, tapered or spherical bores. It tells you how the Speed Variator Div. of Cleveland Worm and Gear Co., Cleveland, Ohio, handles five different sizes of steel ball rings at production rates on a Gisholt MASTERLINE 51A General-Purpose Superfinisher, arranged to provide 16″ swing.

A special faceplate-type fixture is used for this setup. Five different diameters are machined in the face of this fixture and mate with the outside diameters of the parts handled.

Here's the operation: The workpiece is placed in the fixture, with the back face locating against permanent pins. Clamps hold the part securely. The Superfinishing stone is held on one end of a movable bar, for which a pivot point is provided by a bracket mounted on the traverse carriage. An offset arm on the Superfinishing quill gives the base of the movable bar reciprocating motion, translated into arc motion of the Superfinishing stone. Result: spherical I.D.'s are easily handled and quickly Superfinished to required tolerances.

With this setup, Cleveland Worm and Gear Co. obtains an average production of 50 parts per hour for all five ball ring sizes. The previously ground surface of 20 to 25 microinches RMS is reduced to 2.

Special faceplate fixture cuts change-over time. Pivoting stone holder provides simple, economical means of Superfinishing spherical bores. Machine can be easily changed to handle straight or tapered bores.

Ask for new Superfinisher Cat. 1169-B.





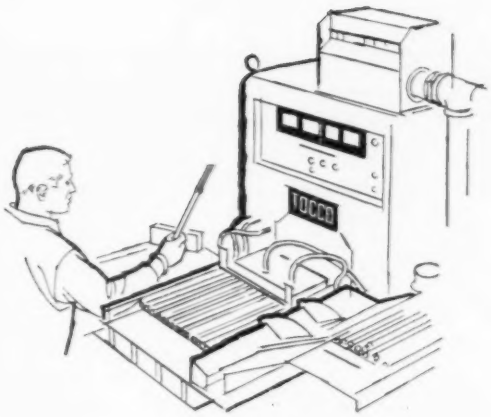
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The Gisholt Round Table represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

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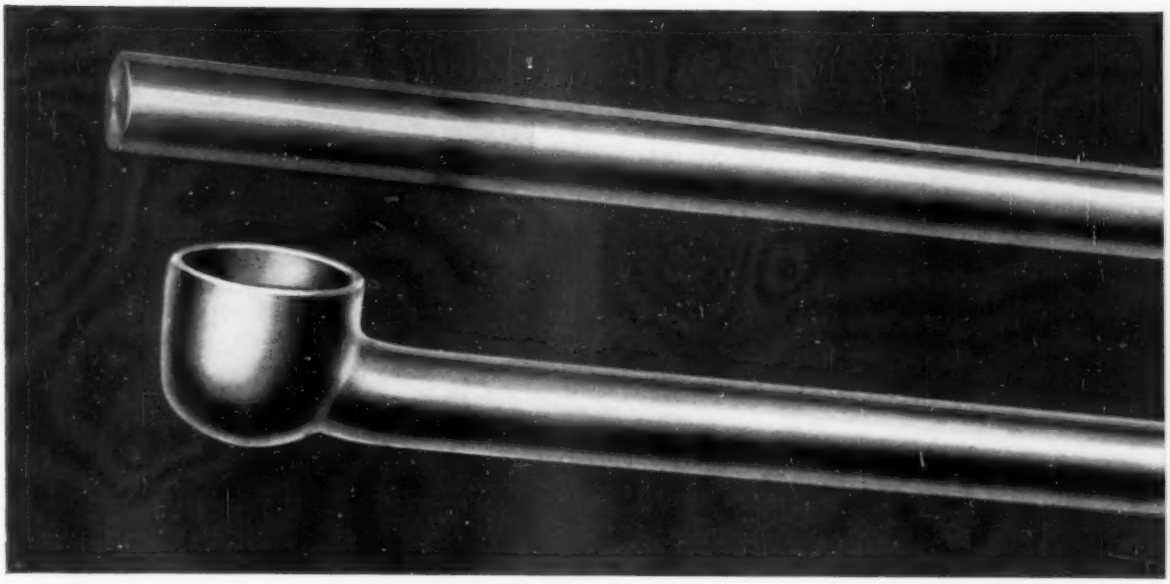
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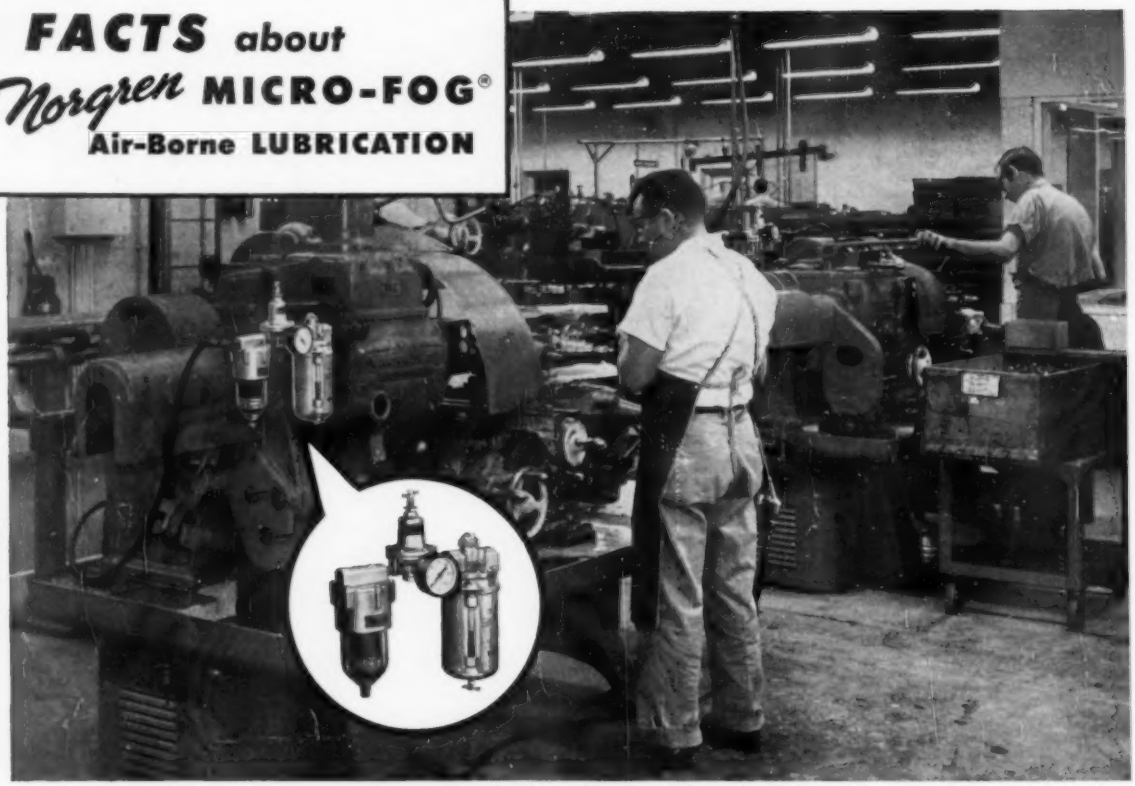
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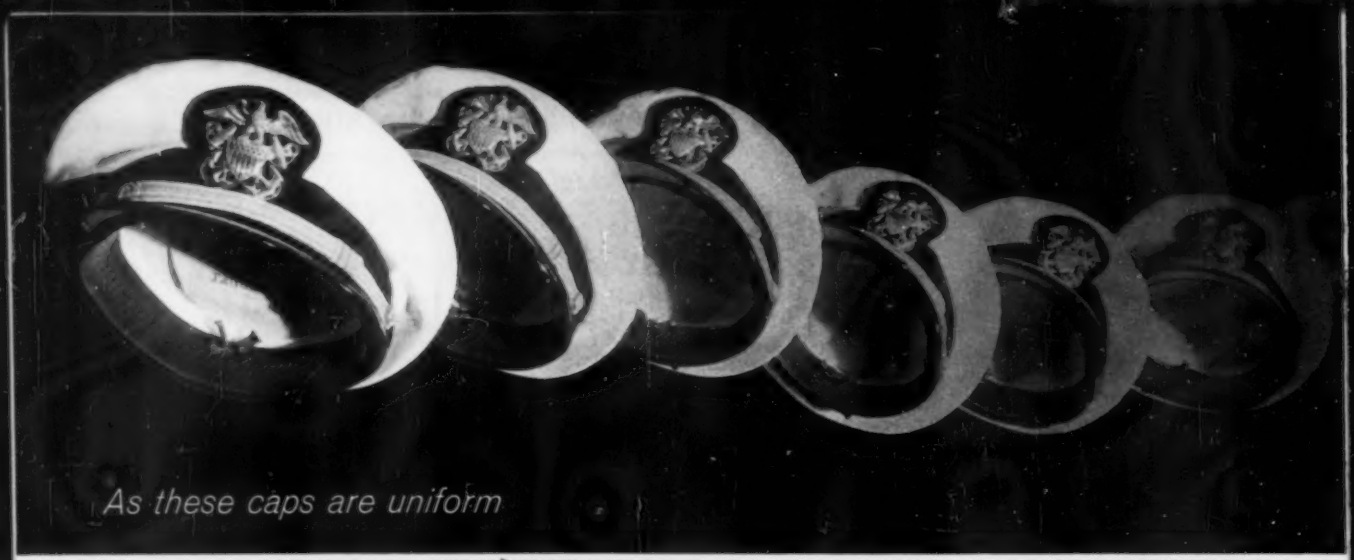
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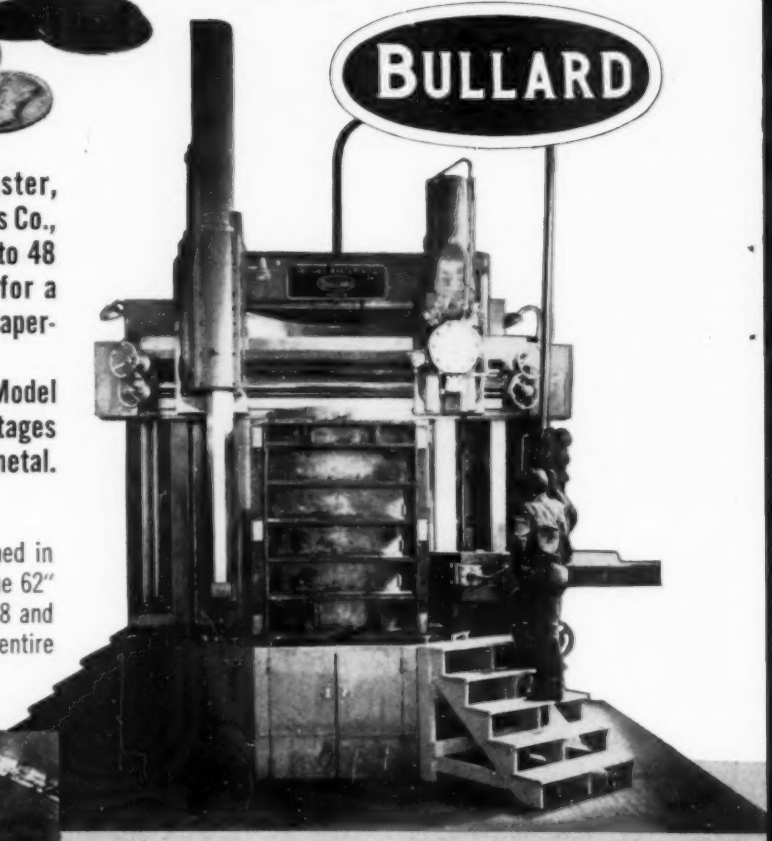
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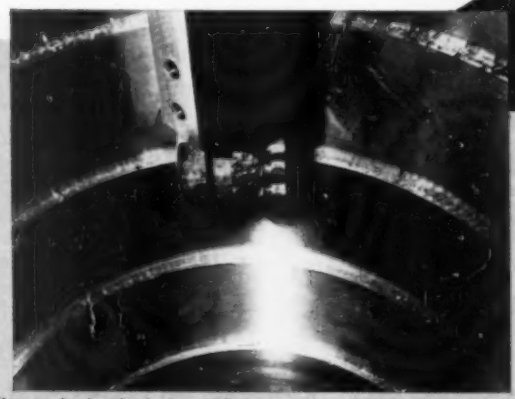


The new 66" Bullard Cut Master, Model 75 purchased by E.D. Jones & Sons Co., Pittsfield, Mass., has reduced from 65 to 48 hours the machining time required for a 4,000 lb. stainless steel piece used in a paper-making machine.

The Bullard Cut Master V.T.L., Model 75 line offers many features and advantages to help you — cut costs when cutting metal.



The part, 68" high, formerly had to be machined in three operations. Now, with an extension on the 62" Ram, a table speed of 9.6 r.p.m., feed of .0208 and ⅛" depth of cut, it is possible to machine the entire depth in one operation.



Close-up showing step boring and facing operation with 370 grade carboloy tool.

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A section of the second operation department of the REVERE CAMERA COMPANY is shown where the precision components for REVERE cameras and projectors are processed.

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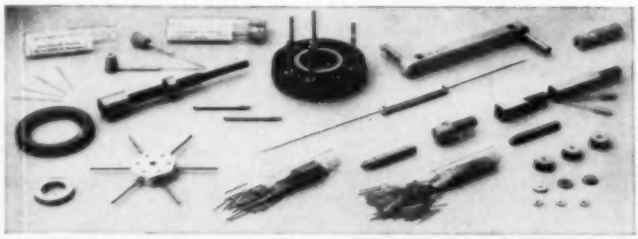


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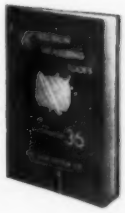
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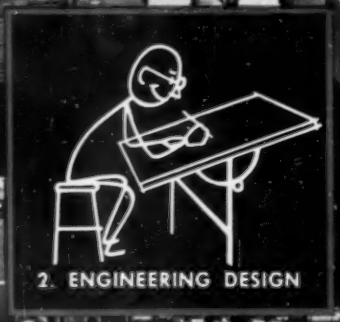
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1. PROJECT ANALYSIS



2. ENGINEERING DESIGN



3. EQUIPMENT CONSTRUCTION



4. INSTALLATION AND TRAINING

This new four phase process development service, backed up by the know-how and experience of the Cross organization, will get results not available by any other means.

Phase I is a "broad brush" engineering study to determine the economic feasibility of the project. Included in the study are part design analyses, equipment specifications, proposal drawings, and cost estimates.

Phase II comprises the engineering and design of the equipment including assembly and detail drawings, testing procedures, and operating and maintenance instruction manuals.

Phase III covers equipment construction, testing and "de-bugging".

Phase IV includes the installation of the equipment together with the training of the operative and maintenance personnel.

At the completion of each phase, the feasibility of the project is reviewed to see that it is within the specifications and objectives which were established at the outset.

All projects are executed at the new Cross plant —created specifically for the development of automation processes and equipment.

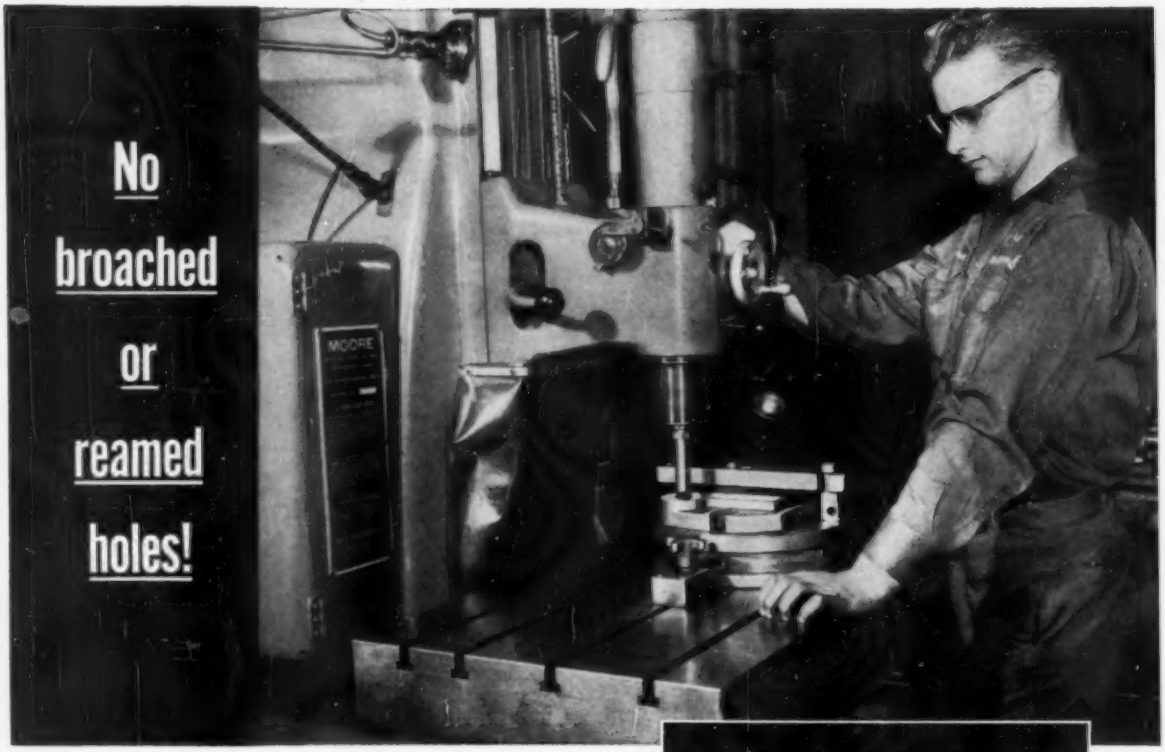
Call us—let's discuss your situation. There is no obligation and the results may surprise you.

Established 1898

THE CROSS CO.

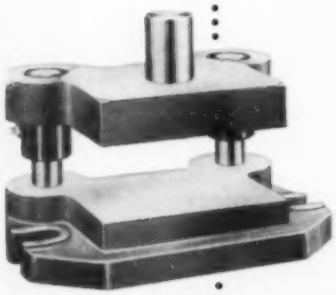
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PARK GROVE STATION • DETROIT 5, MICHIGAN



They're precision bored on master plates to give you absolute interchangeability between any die shoe or punch holder

DANNEMAN PRECISION DIE SETS



Danneman die sets are precision built every step of the way to assure long, trouble-free production accuracy. You can be sure of perfect alignment because we finish Thompson-grind all four horizontal sides . . . assemble with cylinder square fixtures to insure squareness of leader pins and bushings. Even the U-lugs are machined for additional clamping accuracy.

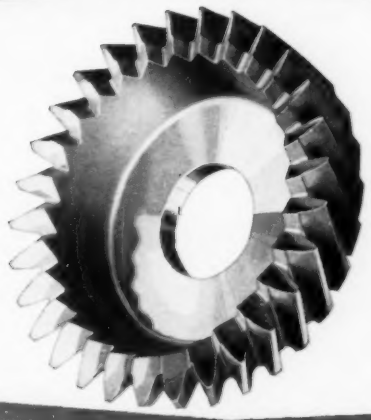
Bushings and leader pins with lubricating devices are Lamina precision hardened and ground — or if you prefer a low cost die set, we can supply regular plain hardened and ground steel bushings with lubricating grooves on the guide posts.

Specify *Danneman* precision die sets on your next job and *see* the difference. Catalog on request.

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DIE SET DIVISION

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makes gear shapers—





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we make rotary
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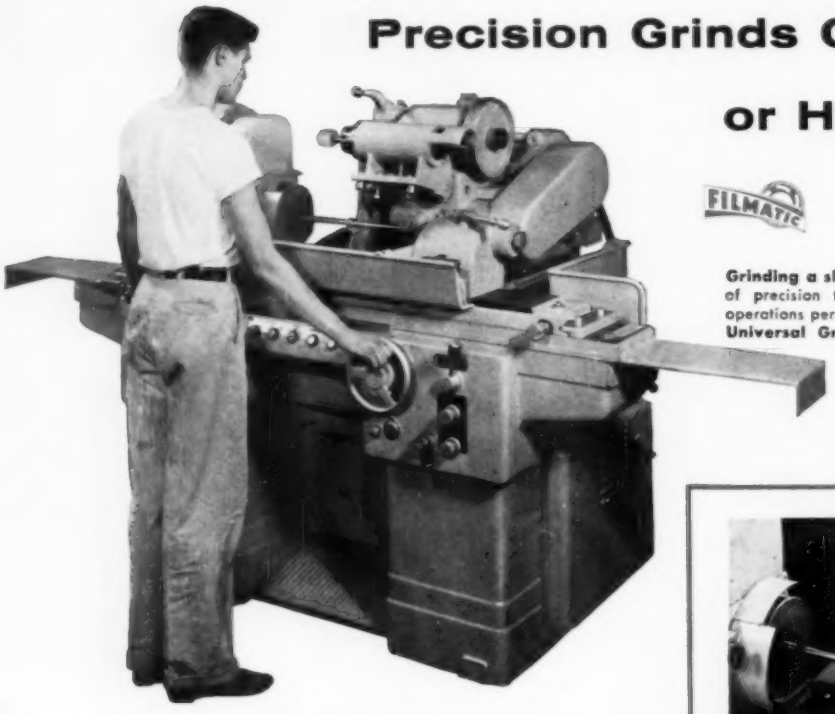
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CINCINNATI 10″ UNIVERSAL

Precision Grinds One Part or Hundreds



FILMATIC

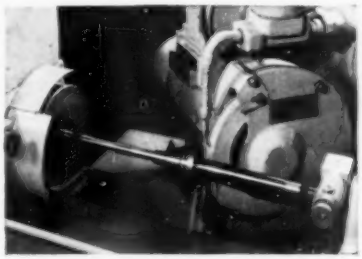
Grinding a slender shaft . . . one of many types of precision toolroom and production grinding operations performed on **CINCINNATI FILMATIC 10″ Universal Grinding Machines.**

Look at your universal grinders from this viewpoint: when the need arises, can they handle big quantities at the low cost expected of high production equipment? It's routine work for the CINCINNATI® FILMATIC 10″ Universal equipped for automatic infeed grinding. Then you can forget about widely varying lot sizes. ¶ The 10″ Universal's extra measure of power is a big factor in both toolroom and production work. Consider these items compared to other machines in its class:

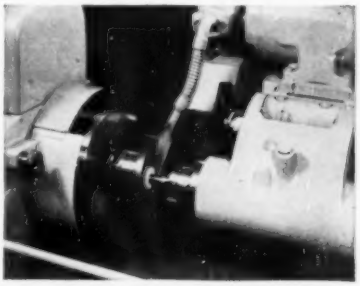
Largest grinding wheel: 12″ diam. x 1½″ face
Most powerful wheelhead motor: 2 hp
50% larger headstock motor
Exclusive FILMATIC grinding wheel spindle bearings

In addition to all these production advantages, the CINCINNATI FILMATIC is a true universal. Wheelhead swivels 180° and 220°, upper and lower, respectively; headstock swivels 180°; headstock speeds are infinitely variable 60 to 600 rpm. Want more information? Sweet's Machine Tool File contains brief specs. Complete data in catalog No. G-577-6.

CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO



Interchangeable drive and grinding wheel, for grinding the right-hand face of shoulders. An excellent finish is produced with this equipment.



Internal grinding, one of the many operations performed at low, low cost on CINCINNATI FILMATIC 10″ Universal Grinding Machines.



Automatic infeed elements. This type of equipment is built-in at the factory, does not restrict versatility of the machine in any way.

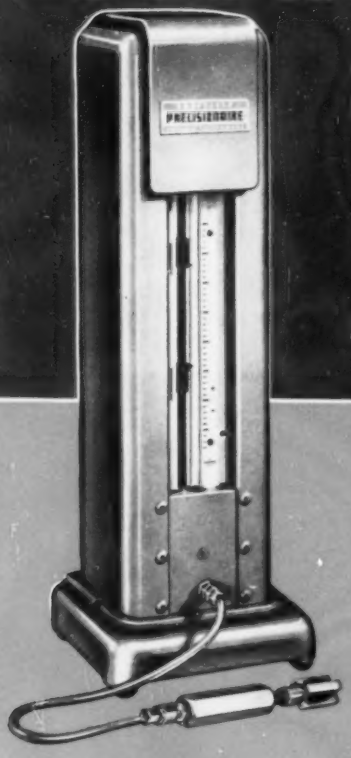
CINCINNATI

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CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES • ROLL GRINDING MACHINES • SURFACE GRINDING MACHINES • CHUCKING GRINDERS
MICRO-CENTRIC GRINDING MACHINES • CENTERLESS LAPPING MACHINES

CUT PRODUCTION COSTS With SHEFFIELD Adjustable AIR GAGES

for Short Runs and Emergencies



SUCH AS:

- Aircraft manufacturers, subcontractors and job shops having limited production.
- Accidental damage to a vitally needed single purpose gage.
- An unexpected engineering change involving part size.
- A short run of special parts for which no gages have been provided.
- A mistake or failure in ordering the needed single purpose gages.
- Sudden need for process gages at the production machines.

Don't let any of these situations cause costly scrap, delays or embarrassing confusion in inspection, in the shop or in the toolroom. A small investment in the adjustable air gages here illustrated is your best insurance against unpredictable production losses. *The Sheffield Corporation, Div. #19, Dayton 1, Ohio, U.S.A.*



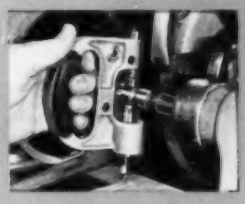
ADJUSTABLE BALLJET SPINDLE KITS
1" to 3"

In 5 minutes you can assemble, for precision gaging, a spindle for ANY SIZE hole from 1" to 3". No auxiliary equipment needed except conventional gage blocks—NOT EVEN ONE MASTER SETTING RING.



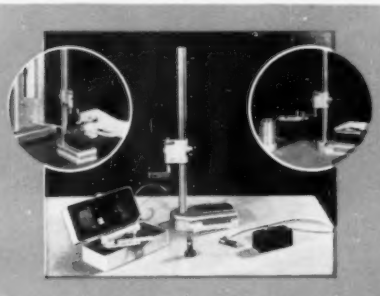
ADJUSTABLE AIREBORE GAGE KITS
3" to 12"

The Airebore Gage can be set precisely to any diameter from 3" to 12" by means of a calibrator and gage blocks. No master rings are needed.



PLUNJET ADJUSTABLE SNAP GAGES
0" to 12"

Twelve Plunjet Adjustable Snap Gages cover a gaging range from 0" to 12"—Larger sizes on special order.



AIRETEST AND PLUNJET STAND

This stand accommodates an Airetest Indicator—also converts to a comparator or height gage by using a Plunjet or dial indicator and anvil.



SELF-CENTERING ADJUSTABLE SPINDLES
$\frac{1}{32}$" to 3"

Four Self-centering Adjustable Spindles cover respectively the ranges of $\frac{1}{32}$" to $\frac{7}{16}$", $\frac{7}{16}$" to $\frac{7}{8}$", $\frac{7}{8}$" to 1$\frac{1}{2}$" and 1$\frac{1}{2}$" to 3". All but the smallest can be set with gage blocks.



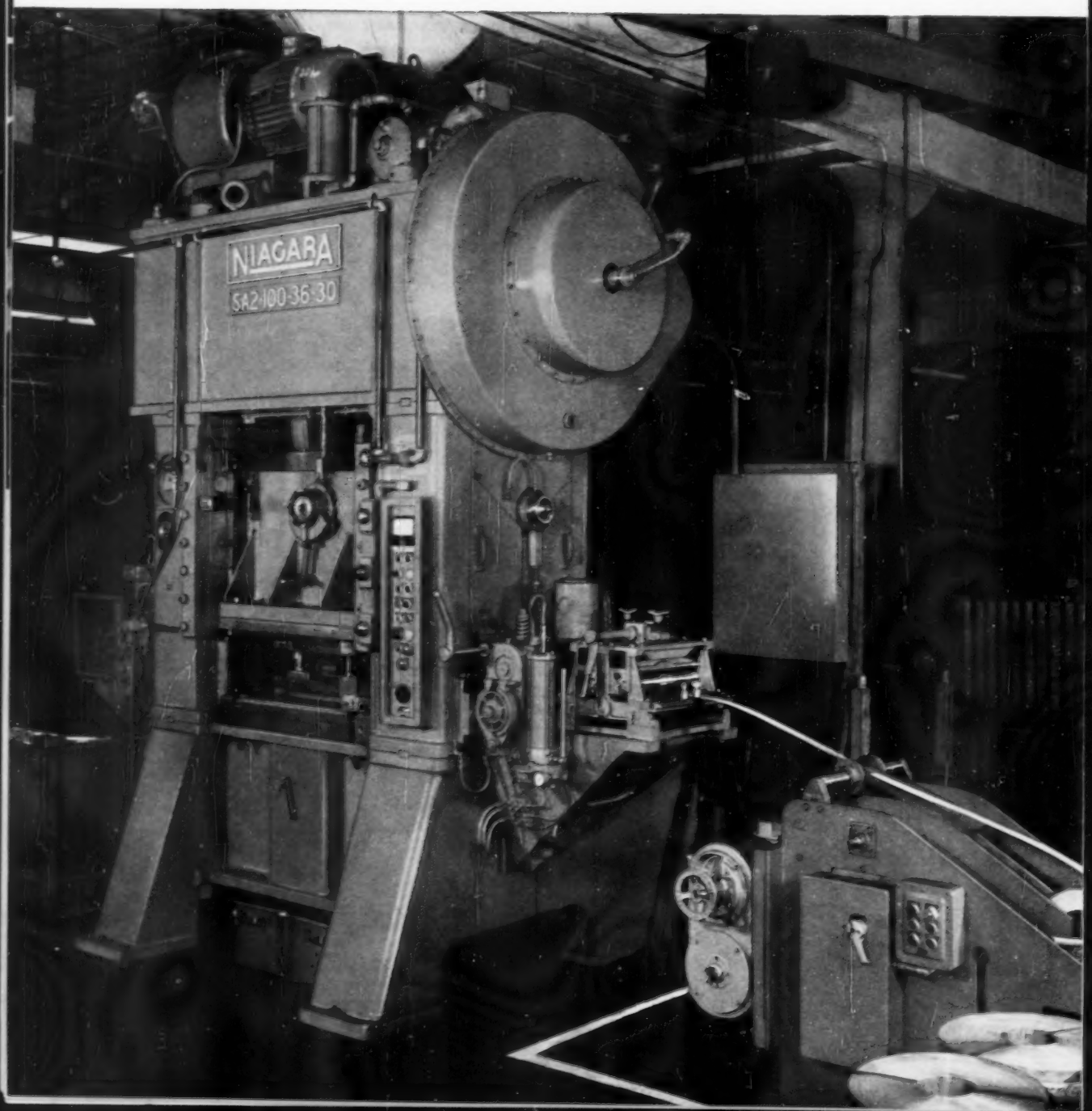
STANDARD ADJUSTABLE AIRSNAPS
$\frac{1}{4}$" to 5$\frac{1}{2}$"

Available in 17 models to cover the range .2500" to 5.500". Up to 3.000" the anvil has an adjustment of $\frac{1}{4}$"—above that, $\frac{1}{2}$".

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AUTOMATIC PRESS

to give you more stampings per hour at less cost... in long and short runs

Build your stamping profits to new heights the modern way: Automatically . . . with an all-new Niagara SA-2. Here's an up-to-the-minute press package that is distinctly different from anything heretofore available . . . complete with ultra-modern automatic feed, plus today's most advanced press mounted controls and devices, to bring you high speed stamping at its very best.

Brand new from crown to base, the Niagara Automatic boasts bonus features throughout . . . features that are unavailable on any other press in this category. Yes, *everything* is new about it, differing sharply from modified, adapted straight side presses of conventional design. Every square inch of its extra massive, rugged construction is *heavier . . . far heavier* for vibration-free, precision performance at high speeds:

KING SIZE CRANKSHAFT AND CRANKPINS — substantially larger than those on traditional straight side presses.

ENTIRE DRIVE IS HEAVIER — gears, electro pneumatic friction clutch, brake, flywheel and motor.

EXTRA BEARINGS — for better support of crankshaft, feed take-off and main gear (or flywheel).

MASSIVE, EXTRA HEAVY FRAME — all steel, 4-piece, tie rod, box type construction (bed, uprights and crown) built to absorb shock and vibration, and provide greater resistance to deflection. Up to 100% heavier than regular straight side press construction. Uprights extra wide to house electrical and circulating oil controls.

RIGID, EXTRA REINFORCED, BOX TYPE SLIDE remains in precise alignment with bed.

EXTRA LONG, SPECIAL SQUARE GIBS guide slide precisely.

LAMINATED, NON-METALLIC WAYS positively prevent welding or galling of bearing surfaces.

AUTOMATIC CIRCULATING OIL SYSTEM keeps all press bearing surfaces continuously lubricated.

ULTRA-MODERN AUTOMATIC FEED perfectly mated to press.

EXCLUSIVE NIAGARA MECHANICAL ROLL LIFTING SYSTEM — built into the press for independent, infinite adjustment of ingoing — outgoing rolls, from floor level.

OVERSIZE ADJUSTABLE AIR COUNTERBALANCE for smoother, safer press performance.

From start to finish, automatic stamping the Niagara SA-2 way, spells endless economies for you. It will pay you to investigate the facts *now*.

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NIAGARA

SERIES SA-2, TWO-POINT STRAIGHT SIDE PRESSES

SHAFT DIAMETERS: 4½-9 INCHES • CAPACITIES: 60-300 TONS

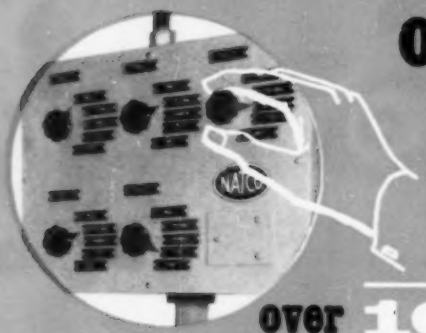
America's most complete line of presses, press brakes, shears, other machines and tools for plate and sheet metal work

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Cost-Cutting Ways
You Can Use
Standard Multi-Spindle Natcos

Any time your parts require machining *more than one hole*–drill, bore, face or tap–it may well be a "Natco Natural." Your standard Natco will produce substantial savings in a surprising number of situations, *even in small job-shop lots!* Call in your nearby Natco field engineer; he'll tell you in short order whether you've got a "Natco Natural" there.

NOW...Set up quickly with a twist of the wrist



5 cycles
5 positions
over 100 combinations



DRILL



STEP DRILL (deep hole)



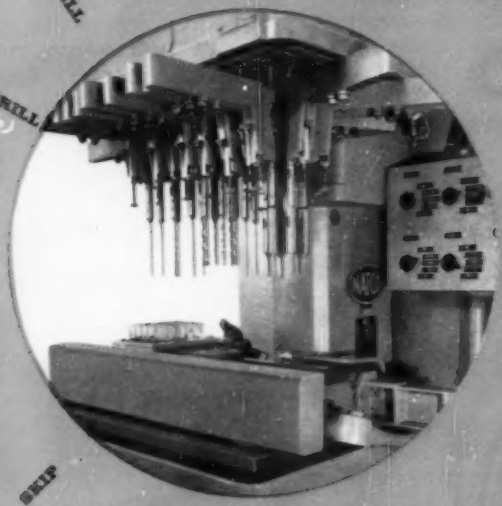
CHAMFER (short feed)



TAP



SKIP



STRAIGHT-LINE INDEX TABLE COMBINED WITH PRE-SET CYCLE SELECTOR

The five-position table mounted on a Natco H-6 adjustable spindle machine equipped with selector control panel makes it possible for the operator to pre-set over 100 machining combinations. Thus the capacity of the machine is greatly increased in number of holes, in complexity of hole patterns, and in variety of machining operations. Machine investment is kept at a minimum for the volume of work produced.

Select either of

2 DEPTHS OF FEED *automatically*

2 FEED RATES *automatically*

2 MOTOR SPEEDS *automatically*

2 INDIVIDUAL SPINDLE SPEEDS PLUS NEUTRAL



Standard multi-spindle Natcos range from 1 hp, 10-spindle machines to 50 hp machines with up to 72 spindles. Spindles in standard Natcos are driven through universal joints and located by either adjustable arms of bored slip plates.

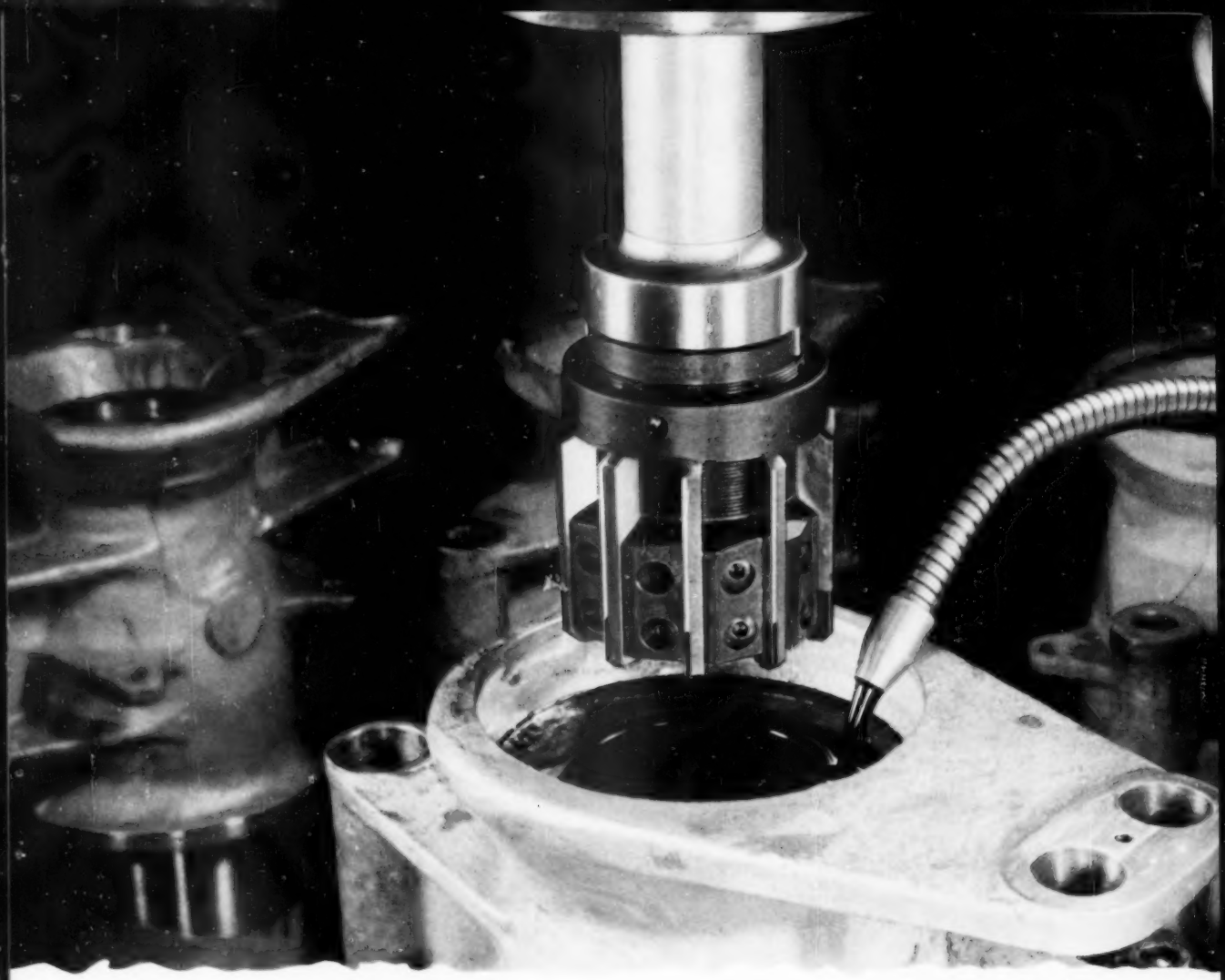
NATCO

National Automatic Tool Company, Inc.

Richmond, Indiana

Multi-spindle drilling, boring, facing & tapping machines. Special machines for automatic production.

Call Natco Offices in Chicago, Detroit, New York, Buffalo, Boston, Philadelphia, Cleveland, Los Angeles; distributors in other cities.



TOOL LIFE INCREASED 400%

CLEVELAND Carbide Tipped Adjustable Reamer sets new high record!

The specifications on this job call for reaming a 4½" hole to a tolerance of .001" and a surface finish of less than 50 R.M.S. (micro-finish). CLEVELAND Carbide Tipped Adjustable Reamers are meeting these requirements day after day... month after month... *and reaming five times as many holes per grind as the conventional high speed reamers formerly used.*

◈ Whenever *you* have a difficult reaming problem, a CLEVELAND Service Representative can help you. Contact our nearest Stockroom, or...



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COMPARE!

the inside design features of 4 leading dial indicators



COMPARATIVE ANALYSIS OF SEVEN ESSENTIAL INDICATOR COMPONENTS

● INDICATES HIGHEST RATING HARDNESS READINGS FROM ROCKWELL "C" SCALE	SPINDLE HARDNESS	PINION TEETH HARDNESS	PIVOT HARDNESS	BRONZE BEARINGS	REMOVABLE BEARINGS	SHOCKPROOF AT SPINDLE	SHOCKPROOF AT NO EXTRA COST
STANDARD GAGE	RC 59	RC 55	RC 55	YES	YES	YES	YES
MAKE A	RC 25	RC 55	RC 55	No	No	No	No
MAKE B	RC 25	RC 25	RC 25	No	No	No	No
MAKE C	RC 43	RC 43	RC 43	YES	YES	YES	No

In addition to features listed in this chart, STANDARD Dial Indicators have lapped pinion teeth, burnished pivots and highly polished spindles.

Superior Construction Invariably Leads To Better Performance

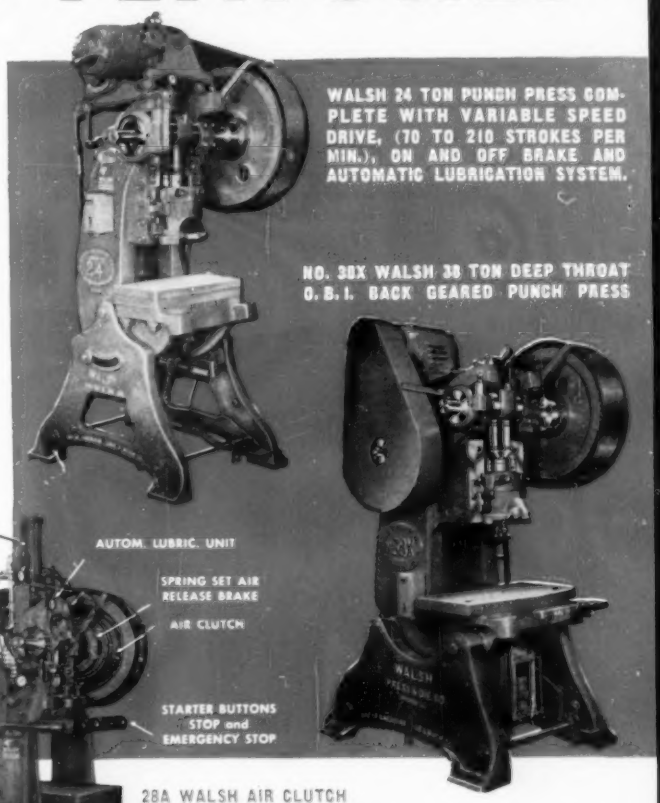
Firms keeping accurate records of indicator servicing show lowest *in-use* costs for STANDARD dial indicators. Spindle and pinion teeth hardness, bronze bearings and superior finish virtually eliminate normal wear! See these features in the *Man-from-Standard's* new do-it-yourself test kit.

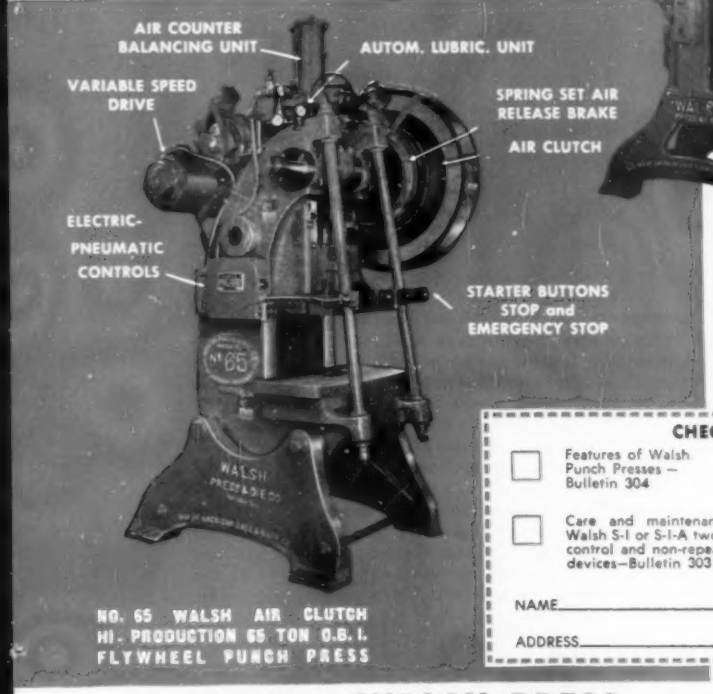
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SINCE 1925
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- ☐ "Spec" chart for Walsh Presses — Bulletin ES102
- ☐ Walsh Presses — Bulletin 353
- ☐ Care and maintenance of Walsh S-I or S-I-A two hand control and non-repeat devices—Bulletin 303
- ☐ Installation — Instructions for Walsh two hand control and non-repeating devices —Bulletin ES108
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Flying finish for jet engine parts

...10 times as fast with precision OSBORN Brushamatic® Methods



JET ENGINE COMPONENTS *are precision finished automatically at high production rates on Osborn Brushamatic® 51-OOL Machine.*

HERE'S how a jet engine manufacturer has broken a production bottleneck . . . saved dollars and days in the precision-finishing of jet engine components . . . with Osborn Brushamatic® Methods.

Sharp edges, burrs or scratches on components cause stress concentrations and resulting fractures—so a high degree of surface refinement is essential. *Tedious hand finishing each of these parts used to take 80 minutes.* Still, job quality was inconsistent . . . costly in time and money.

Today, Osborn Brushamatic does the same job in 8 minutes . . . 10 times as fast . . . with a high-quality, uniform finish held to micro-inch specifications.

It's typical of how Osborn Power Brushing works to help *you* speed production . . . cut costs . . . improve product quality. An **O**sborn **B**rushing **A**nalysis, made in your plant at no obligation, will show you how. Write us for details—and for your copy of the 20-page Brushamatic® booklet. *The Osborn Manufacturing Company, Dept. K-42, Cleveland 14, Ohio.*

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61 models

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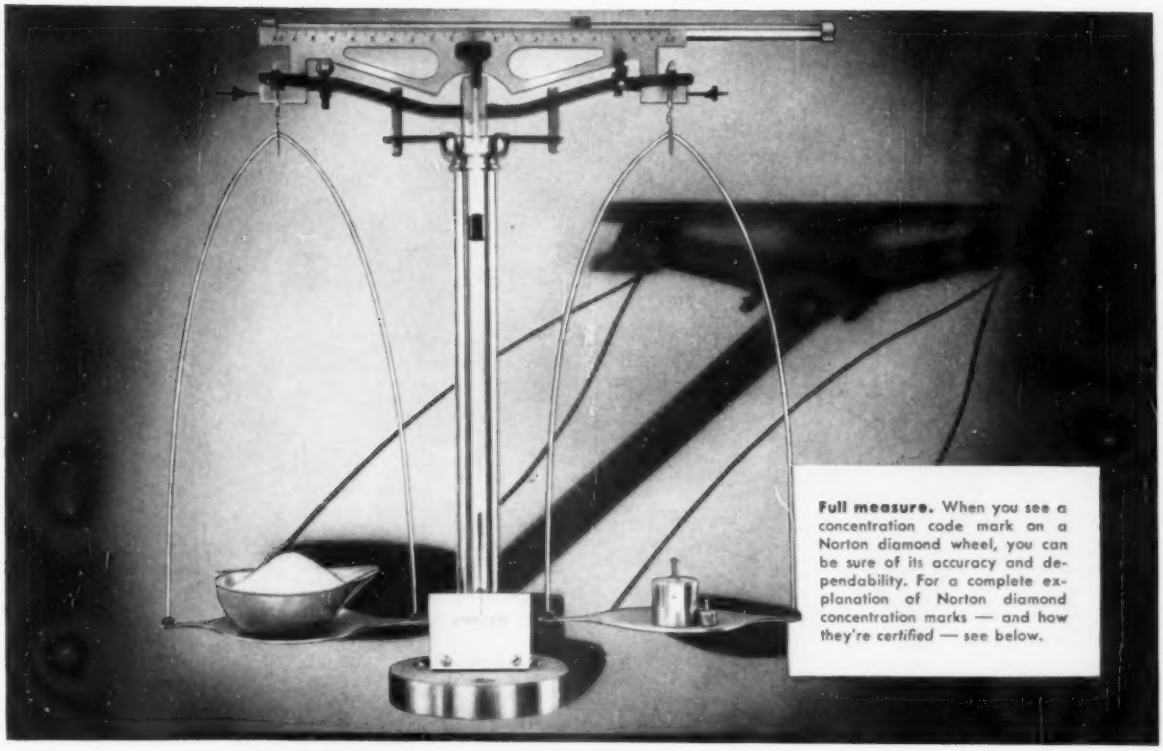
Webber **GAGE COMPANY**
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Set No. 88A w/accessories plus one pair .100 and one pair .050 Croblox wear blocks.



LARGEST EXCLUSIVE MANUFACTURERS OF PRECISION GAGE BLOCKS



Full measure. When you see a concentration code mark on a Norton diamond wheel, you can be sure of its accuracy and dependability. For a complete explanation of Norton diamond concentration marks — and how they're certified — see below.

You get CERTIFIED DIAMOND CONCENTRATION with every Norton diamond wheel

Stamped on every Norton diamond wheel — or its container, in the case of various smaller wheels—you'll find a diamond concentration mark.

If the mark is 100, it means that each Norton 100 concentration diamond wheel contains an amount of diamond in carats calculated to a formula of 72 carats per cubic inch. Wheels of 75, 50 and 25 concentration of diamond contain 75%, 50% and 25% of this 100 concentration standard respectively.

The finished wheel contains the calculated number of carats of diamond except for the slight loss resulting from truing the diamond section to place the wheel in proper truth and condition for grinding.

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With each Norton diamond wheel you get a certificate of the accuracy of its diamond concentration, as marked. So, for your complete protection in diamond wheel buying, you can depend on this Norton marking to mean exactly what it says.

That's just one reason why it pays to buy Norton diamond wheels — made by the leader in diamond wheel development and manufacture. Norton was first to introduce all three types of diamond wheels — metal, resinoid and vitrified bonded . . . duplicates wheel specifications with constantly controlled accuracy . . . and does all its own sizing, grading and laboratory checking of diamond bort.

Your Norton Distributor

can give you prompt service on all types and sizes of diamond wheels. Or write to NORTON COMPANY, General Offices, Worcester 6, Mass. Plants and distributors all around the world.

W-1837



The fourth and fifth numerals of this Norton diamond wheel concentration mark are 50, as shown here. Make this and all other certified concentration marks on Norton diamond wheels your buying guide to better grinding at lower cost.

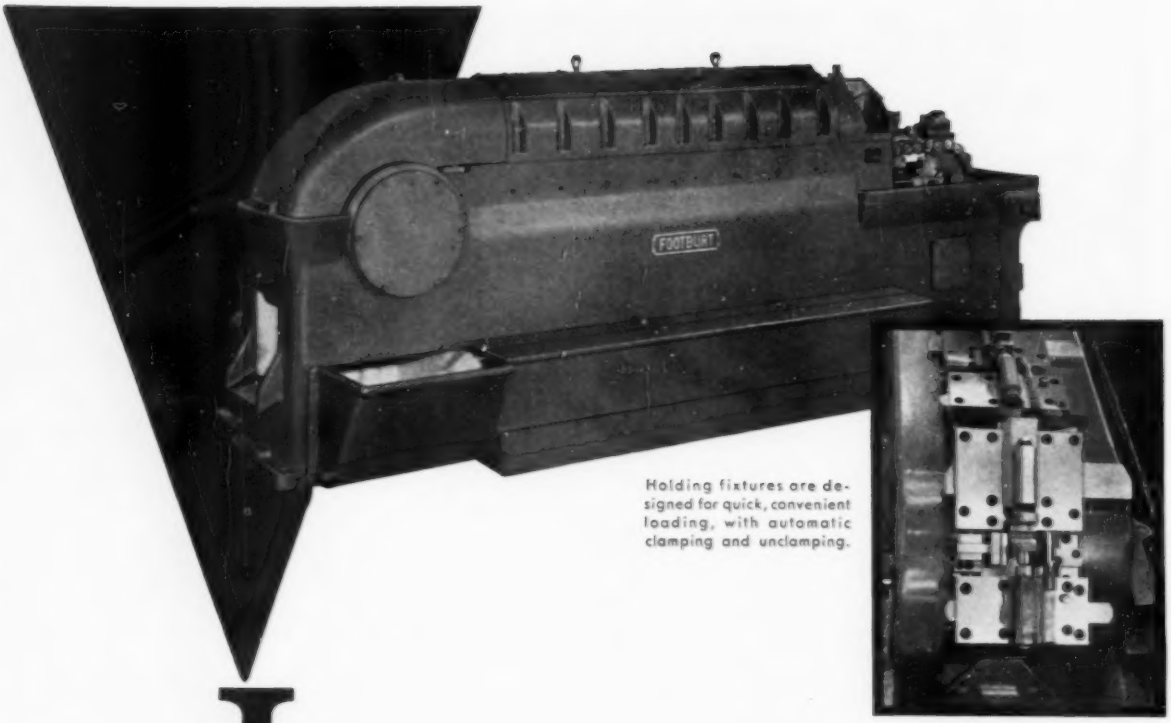


The complete line. Norton diamond wheels, the recognized "Crown Jewels" for value and performance, include sizes and types for every application, in every field — carbides, stone, glass, ceramics, electronics, etc.

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Making better products . . . to make your products better

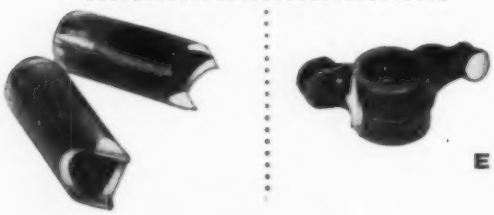
NORTON PRODUCTS Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING DIVISION Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes



Holding fixtures are designed for quick, convenient loading, with automatic clamping and unclamping.

LOWER COST . . . PER PIECE WITH SURFACE BROACHING OF SMALL PARTS





In many plants where large quantities of duplicate metal parts are being machined, substantial savings are being made through the adoption of surface broaching. Production is exceptionally high, close tolerances are maintained, and tool maintenance costs are much lower than with ordinary methods. Foote-Burt engineers, pioneers in this advanced machining method, have had a wide experience in applying surface broaching, in many fields.

THE FOOTE-BURT COMPANY
Cleveland 8, Ohio

Detroit Office: 24632 Northwestern Highway, Detroit 35, Mich.

ENGINEERED FOR PRODUCTION

Write for Circular No. 503

FOOTBURT

PIONEERS IN SURFACE BROACHING

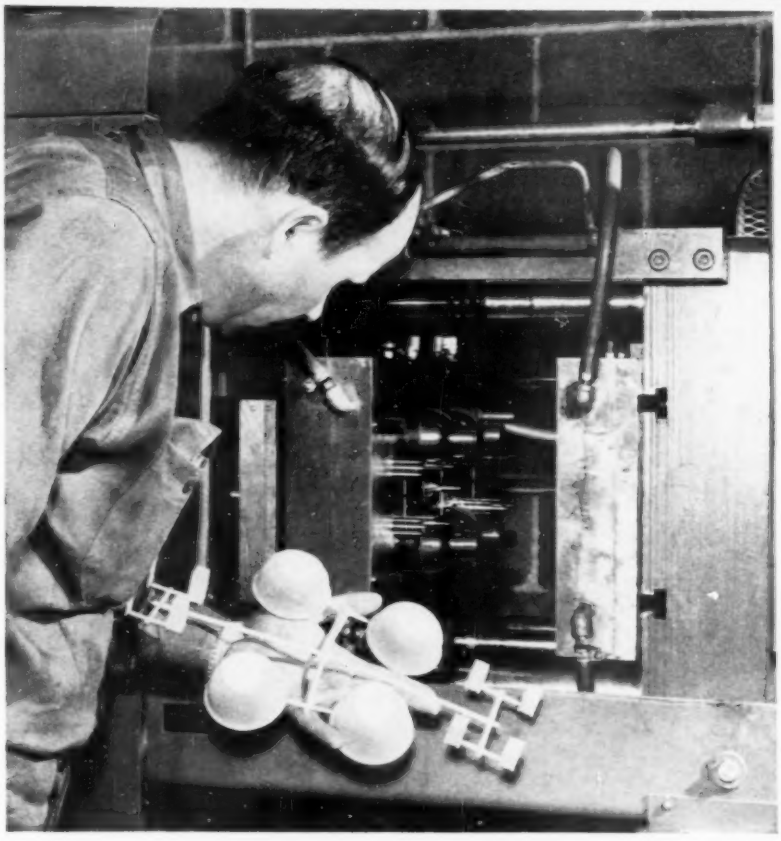
Tool Steel Topics

BETHLEHEM STEEL

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Export Distributor, Bethlehem Steel Export Corporation



For long runs and high polish they molded bowls with Lustre-Die

Our local tool steel distributor, Ford Steel Co., St. Louis, answered the question frankly. "If you're looking for high sheen on the finished product," they said, "and want a long-lasting die as well, we recommend Lustre-Die."

The die manufacturer, Lambert Engineering Co., St. Louis, put Lustre-Die to the test. They prepared the dies to produce plastic bowls used in a popular blender, for Chris Kaye Plasties Manufacturing Co., Madison, Ill. The result? Excellent die performance, and a fine looking product as well.

Lustre-Die is a really top-grade tool steel for making plastic parts because it has the properties which enable it to take an unbelievably bright polish. Lustre-Die not only has the proper basic analysis for working with plasties — we further improve it by alloy fortification, increasing its depth of hardenability and mechanical properties. It is heat-treated by oil-quenching and tempering, and is furnished ready for machining and polishing.

Lustre-Die is carefully made in the electric furnace. It undergoes close inspection to insure cleanliness. Moreover, it is free from injurious porosity or surface pitting.

Any way you look at it, Lustre-Die is fine tool steel, and a good performer. If you would like full information, check with your Bethlehem tool steel distributor.

BETHLEHEM TOOL STEEL ENGINEER SAYS:



There's No Scorch With Proper Grinding

The redressing of worn tools by grinding is often done improperly. This causes a lower service life after regrinding than on the original grind.

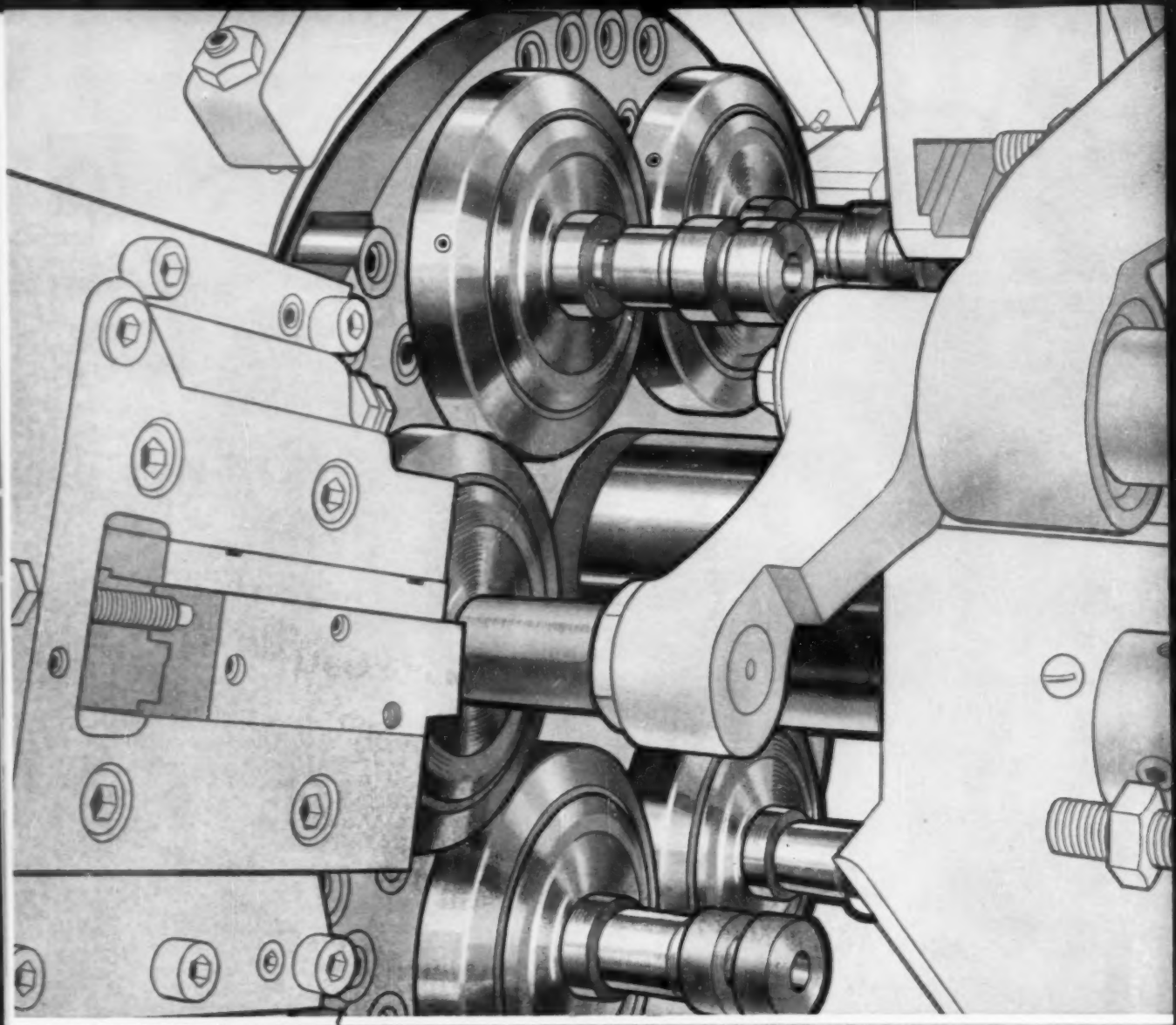
The most common error in regrinding tools is the removal of metal so rapidly that the heat generated causes a "tempering back," or softening of the steel in areas which have been ground. Thus, the reground tool is softer in the working areas than it was originally, and therefore wears more rapidly. Abusive grinding is almost always accompanied by scorching, which produces purple, blue and yellow temper colors where the grinding has been done.

Many operators realize that the appearance of scorching is an indication of improper grinding, and they therefore make it a point to remove the scorched areas with a final, light grinding pass. This removes the visible evidence of scorch but does not remove the harmful effects. Tools which are being properly ground do not develop scorch in grinding.



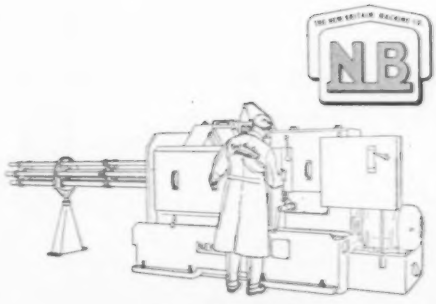
USE CROMO-WV DISCS TO EXTRUDE ALUMINUM

This Bethlehem upset-forged disc, to be used in extruding aluminum, is made of Cromo-WV Hot-Work tool steel. Cromo-WV makes possible increased production of aluminum extrusions because it is resistant to heat-checking, and has adequate wear-resistance and toughness. Cromo-WV also responds accurately to heat-treatment. It's good tool steel — worth ordering for your next extrusion job.



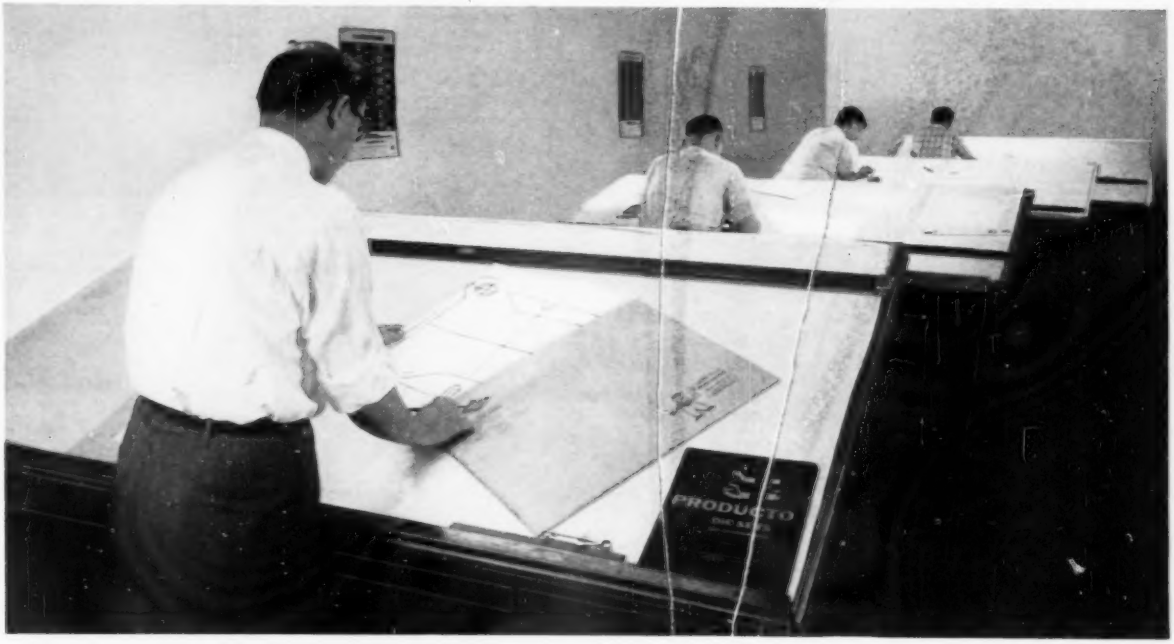
get more bar work done with the widest range of spindle speeds

The New Britain Model 62, 2¼" automatic bar machine illustrated, has a spindle speed range of 117-3,000 R.P.M. No other multiple spindle bar machine in its capacity offers as wide a range of spindle speeds combined with New Britain standards of accuracy. Before you decide on *any* bar machine, be sure to check on *new* developments in New Britains. The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.



Automatic Bar Machine

Why the Die Designer Prefers PRODUCTO Die Sets



He can specify Producto with complete confidence

The die designer likes to specify Producto die sets on his blueprints because they are a nationally-accepted "brand." They're easy to get anywhere... and delivery is prompt.

He favors Producto because he knows he never has to compromise his die design. Even if the die layout is a little unusual, he will be able to select a die set to accommodate it from Producto's wide range of thicknesses and styles.

He also knows Producto has the equipment that can cut his tooling costs by letting him adapt his sets to a more economical *basic* design. Only Producto offers him complete foundry, pattern-making, welding and machining services for his special requirements.

The die designer recognizes Producto's Qwik-Fit Guide Pins as an important new feature that die makers want. He specifies them because they save up to 75% of the time normally required for die set assembly and disassembly.

The die designer likes to use Producto's new catalog, the industry's most practical tool. His die layout is simplified when he uses Producto die set templates. And Producto provides him with cost-saving ideas in the DIE SET DIGEST.

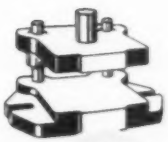
Most important, he can depend on *consistent* Producto die set accuracy to transfer from the drawing board to the press the precision and ingenuity of his die design.

Yes, the designer has found that Producto die sets justify his confidence in specifying Producto. You will, too.



TWO FREE AIDS to more economical, efficient use of die sets are available from Producto. All-new CATALOG NO. 11 makes ordering and selection job easy. DIE SET DIGEST gives valuable tips for designers, builders and users of dies. Write for them today.

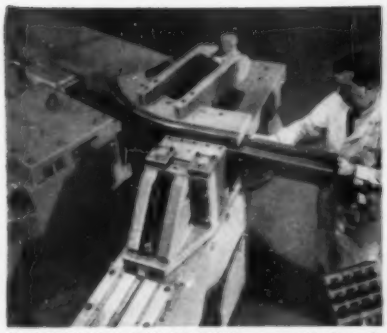
THE PRODUCTO MACHINE COMPANY
930 Housatonic Ave., Bridgeport 1, Connecticut



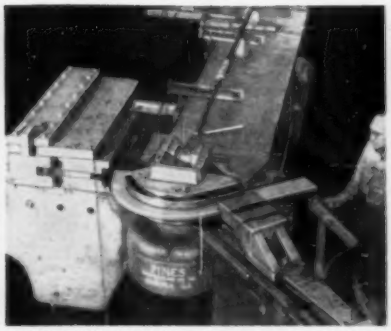
Wherever die sets are used

PRODUCTO

PRODUCE MORE WITH PRODUCTO PRECISION DIE SETS



HEAVY RECTANGULAR TUBES—accurately formed on Pines Model 4 on a 24" inside radius for air cushion assembly on heavy duty truck chassis. Material is 4" x 5½" x .200" wall.



SOLID STEEL BEAMS—cold edge bending of 5⅛" x 1¼" steel bars on Pines Model 4 replaces hot bending on dozer, produces more accurate parts at lower cost for road machinery manufacturer.

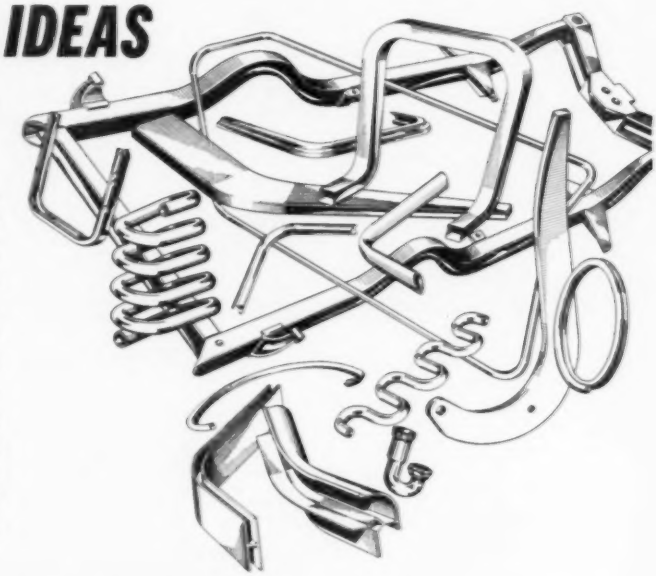


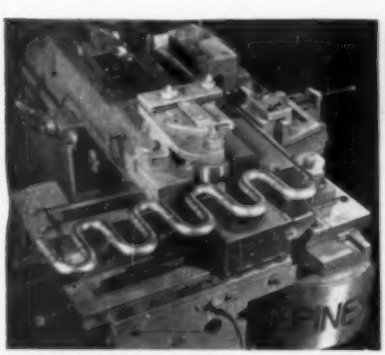
ALUMINUM CHANNELS—rugged machine construction and tooling on Pines Model 3 Machine cold forms 4" x 1¾" x .320" aluminum channel without wrinkling or distorting. Spring-back is controlled by simple machine settings.

FOR COST CUTTING IDEAS

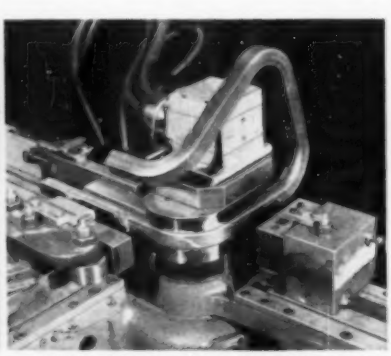
INVESTIGATE PRODUCTION BENDING THE "PINES-WAY"

When you have a production job requiring the cold forming of parts from round, square, rectangular, extruded, or hollow stock to an even radius; or to different angles, we suggest you investigate the cost cutting advantages of production bending the Pines-way. The examples shown here illustrate a few of the many different and varied applications which are today profitably produced on Pines machines. Cold bending is a fast, accurate, easy to control metal forming process that is today more profitably applied in the production of an ever increasing variety of products. Call on Pines engineers for assistance without obligation on any specific job.

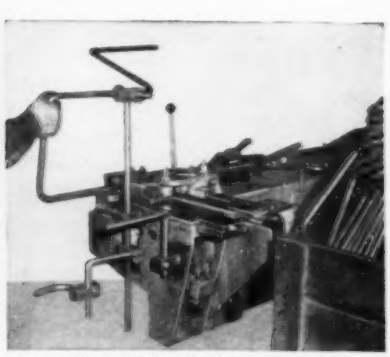




COPPER SERPENTINE BENDS—¾" O.D. x .035" copper tubing is rapidly formed on this Model ¾ into serpentine coils on a 1" ctr. A simple gang-slitting operation produces 180° return bends.



WRINKLE-FREE SQUARE TUBE BENDING—Model 1 Machine, equipped with flexible mandrel and self-opening bending form, produces top quality office and hospital equipment at speeds of 250 bends per hour.



FAST ROUND-TUBE BENDING—Pines Model ⅜ Machines speed production of tubular dinette and lawn furniture. Fast, automatic cycling and accurate progressive bending produce 600 to 900 bends per hour.

PINES ENGINEERING CO., INC.

Specialists in Tube Fabricating Machinery

693 WALNUT • AURORA, ILLINOIS

WRITE FOR FREE DATA SHEETS

To keep abreast with bending, write for free copies of "Pines News" — gives complete data on new production applications.



PRODUCTION BENDING • DEBURRING • CHAMFERING MACHINERY



New rigidity, economy and exact adjustment

The New Staples Expansion Machine Reamer*

This new Carbide Reamer combines the rigidity of a solid body reamer with exact, parallel size adjustment to compensate for wear. The shell-type construction allows easy, economical replacement.

They are made in a wide range of sizes and styles to fit your requirements. Write today for further information.

*Patented

58-1

Staples
ROTATING CARBIDE TOOLS

THE Staples TOOL COMPANY
2352 Glendale-Milford Road, Cincinnati 15, Ohio

There IS a Big Difference in Saw Blade

Try DoALL *CLAW-TOOTH* on Your Next Job!

How the CLAW-TOOTH blade reduces contour or cut-off *sawing costs* . . .

CUTS ALL MATERIALS—Steel, titanium, brass, iron, asbestos, plastics, wood, rubber and many other metals and non-metallics.

EXTRA FAST CUTTING—The claw-like, positive rake angle teeth literally "pull themselves" into the work—providing more penetrating power and smoother chip flow.

EXTRA LONG LIFE—Made sharp to *stay* sharp—scientifically designed tooth and gullet shape gives you longer blade life. Teeth are securely anchored to the flexible back to take heavy cutting loads without breakage.

EXTRA EASY CUTTING—Its "bite-in" cutting efficiency requires less feed pressure, resulting in more output with less work per operator.

ACCURACY OF SET ± .002"—Only DoALL *guarantees* this set accuracy. It means you get straight, accurate cutting of virtually any material . . . freedom from binding . . . ability to produce a predetermined kerf size and surface finish.

CLEAN, BURRLESS CUTTING—Means less finishing and grinding costs.

GUARANTEED UNCONDITIONALLY—to be completely free of defects in material, workmanship, heat treating and packaging.

Convenient "strip-out" Containers —

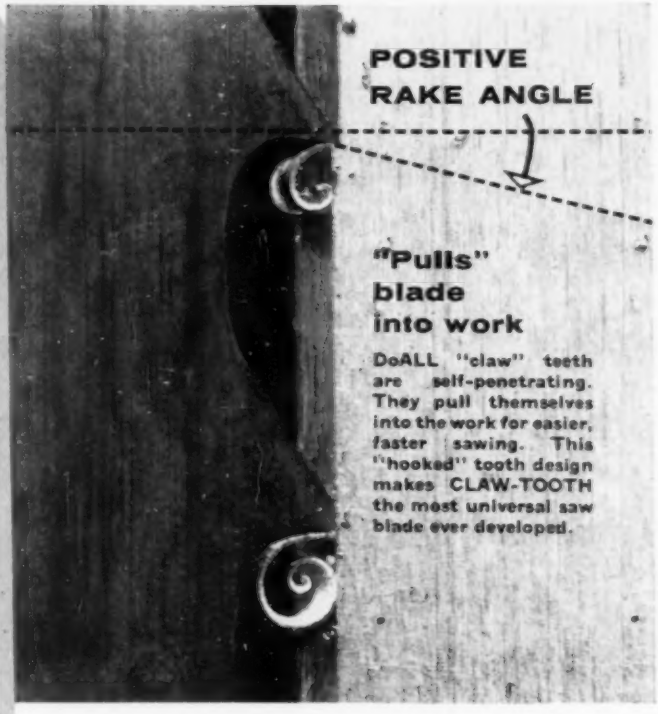


100' or 500' coils in exclusive DoALL "strip-out" boxes for convenience, safety and blade protection.

Custom Welded Lengths —



to fit any band sawing machine. Individual packages or cartons of six packaged blades.



Available in CARBON or HIGH-SPEED STEEL

They'll saw faster on any machine!

There's a DoALL saw band for every machine and job . . . but the blade that handles *more* jobs *better* is the CLAW-TOOTH! For cut-off jobs or contour sawing, the versatile CLAW-TOOTH blade can reduce both your sawing costs and blade inventory.

Available in ¼" to 1" blade width—2, 3, 4, and 6-pitch. For lowest cost per square inch of cutting, specify DoALL CLAW-TOOTH. Or, if you have a special sawing problem, ask about DoALL's free blade selection service—complete recommendations will be furnished for your job.

Call DoALL locally for details, or send for FREE catalog listing complete line of DoALL band tools.

5B-58

Find Your DoALL Store In The 'Yellow Pages'

DoALL



THE DoALL COMPANY, Des Plaines, Illinois



THIS IS A TYPICAL DoALL STORE

Call Your DoALL Service-Store



Columbia Tool Steels for 1957-58
with A.I.S.I. Identification and Type Classification of Tool Steels

GRADE	Identifying Elements, in Per Cent										
	Type	C	Mn	Si	Cr	Ni	V	W	Mo	Co	Cb
HOT WORK TOOL STEELS — TYPE SYMBOL H											
H1-H19, INCL., CHROMIUM BASE TYPES (H1-H10 AND H17-H19 UNASSIGNED)											
FIREDIE-CASTDIE	H11	.35	—	—	5.00	—	.40	—	1.50	—	—
ALCODIE	H12	.35	—	—	5.00	—	.40	1.50	1.50	—	—
VANADIUM CASTDIE	H13	.35	—	—	5.00	—	1.00	—	1.50	—	—
	H14	.40	—	—	5.00	—	—	5.00	—	—	—
	H15	.40	—	—	5.00	—	—	—	5.00	—	—
	H16	.55	—	—	7.00	—	—	7.00	—	—	—
H20-H39, INCL., TUNGSTEN BASE TYPES (H27-H39 UNASSIGNED)											
	H20	.35	—	—	2.00	—	—	9.00	—	—	—
FORMITE 2	H21	.35	—	—	3.50	—	—	9.00	—	—	—
	H22	.35	—	—	2.00	—	—	11.00	—	—	—
	H23	.30	—	—	12.00	—	—	12.00	—	—	—
FORMITE 3	H24	.45	—	—	3.00	—	—	15.00	—	—	—
	H25	.25	—	—	4.00	—	—	15.00	—	—	—
CLARITE J	H26	.50	—	—	4.00	—	1.00	18.00	—	—	—
CLARITE HW	H26	.50	—	—	4.00	—	1.00	18.00	—	—	—
H40-H59, INCL., MOLYBDENUM BASE TYPES (H40, H44-H59 UNASSIGNED)											
	H41	.65	—	—	4.00	—	1.00	1.50	8.00	—	—
	H42	.60	—	—	4.00	—	2.00	6.00	5.00	—	—
MOLITE HW 10	H43	.55	—	—	4.00	—	2.00	—	8.00	—	—

Third of a Series of Six Charts Covering A.I.S.I. Tool Steel Type Classifications

COLUMBIA TOOL STEEL COMPANY • CHICAGO HEIGHTS, ILLINOIS

CENTRAL OFFICE AND WORKS, CHICAGO HEIGHTS, ILLINOIS — BRANCH STOCKS IN THE FOLLOWING CITIES:

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Cincinnati 25 — 2716 Spring Grove Ave. — Phone MUlberry 1-8400
Cleveland 14 — 1640 St. Clair Ave. — Phone MAin 1-1785
Detroit 3 — 121 Oakman Blvd. — Phone TUlsa 3-3770
Los Angeles 22 — 6955 E. Bandini Blvd. — Phone RAymond 3-4684
Milwaukee 19 — 5202 W. Lincoln Ave. — Phone LIncoln 3-5200
St. Louis 13 — 5118 Easton Ave. — Phone FOrest 1-0641

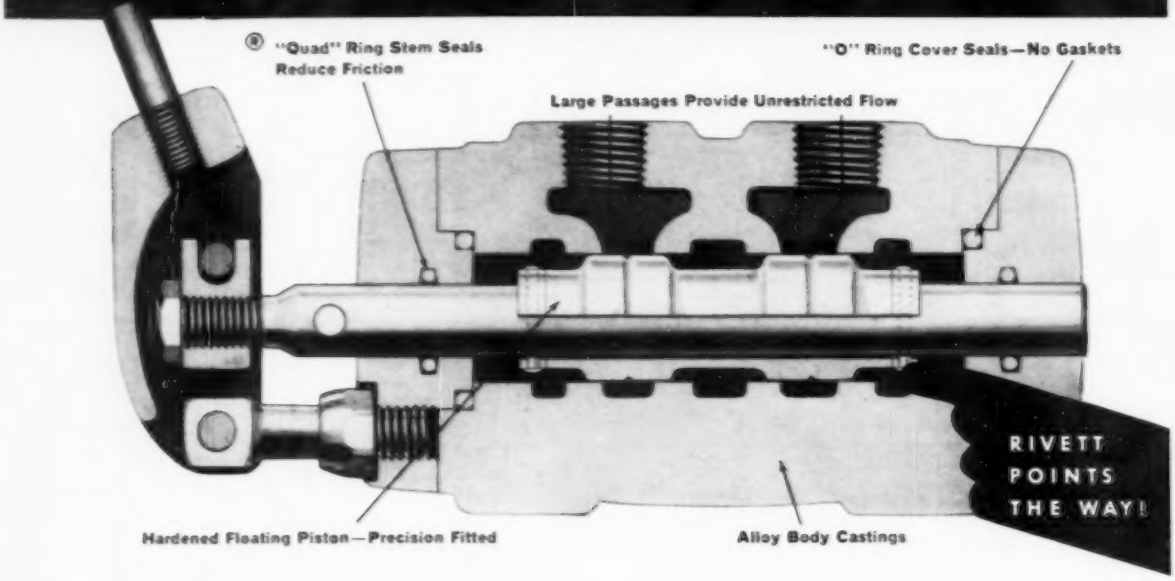
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TOOL COLUMBIA STEELS

COLUMBIA TOOL STEELS

HIGH SPEED STEELS: Clarite — Vanite — Carvite — Acmite — Cobite — Maxite — Molite — Molite Smoothcut — Molite #3 DIE STEELS: Superdie — Atmodie — Atmodie Smoothcut — E-Z-Die Smoothcut — Oildie — Exl-Die — Framdie SHOCK RESISTING STEELS: Buster Alloy — CEC Smoothcut CARBON TOOL STEELS: Columbia Special — Vanadium Extra — Waterdie Extra — Columbia Extra — Columbia Extra Headerdie — Vanadium Standard — Waferdie Standard — Columbia Standard — Columbia Electrex

No Stick! No Bind!



-with Floating Piston!

Valve Stem is Independent of Valve Bore
in Rivett Hydraulic Pipe Mounted Valves

Other Fine Features Benefiting Your Circuit Design and Operation

- "Quad" Ring Stem Seals Reduce Friction
- Large Passages Provide Smooth, Full Capacity Flow
- Simple Design Assures Leakproof Operation
- Opens And Closes Smoothly, Positively
- Operates Multi-Million Cycles At 1500 P. S. I.

1607 VALVE SELECTIONS!

Types: Hand, foot, cam, solenoid, pilot, oil pressure, air pressure, flow control, check, deceleration, relief, unloading, sequence, counterbalance.

Sizes: ¼", ⅜", ½", ¾", 1", 1¼", 1½".

Actions: Standard, spring-return, spring-centered, ball detent.

Mountings: Pipe mounted; panel mounted.

P.S.I.: 1500 P.S.I.; 3000 P.S.I. oil service.

Piston designs for any circuit.

RIVETT, INCORPORATED • Dept. TE-1
Brighton 35, Boston, Mass.



THE BETTER YOU KNOW HYDRAULICS THE BETTER YOU LIKE

Get Catalog No. 204 to aid your circuit design. Complete drawings, specifications, cut-away views, tables, diagrams!

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RIVETT
"100"
HYDRAULIC VALVES

STARRETT PRECISION MAKES GOOD PRODUCTS BETTER



New STARRETT DIAL TEST INDICATOR

Sets up in seconds . . . handles any gaging job

Typical of the wide utility of Starrett Dial Indicators and Gages is this new No. 675 Heavy Duty Dial Test Indicator. You'll marvel at how fast it can be set up . . . at the easy way it handles any gaging job on the bench or around machine tools.

Offering similar time and money-saving advantages is the complete line of Starrett High Precision-Low Friction Dial Indicators, featuring simple, interchangeable design. Available in 140 models in regular and *Nonshock* types including all four A.G.D. groups and long range models. Simplified construction and interchangeable design means greater accuracy, longer life and simplified maintenance with lower upkeep costs.

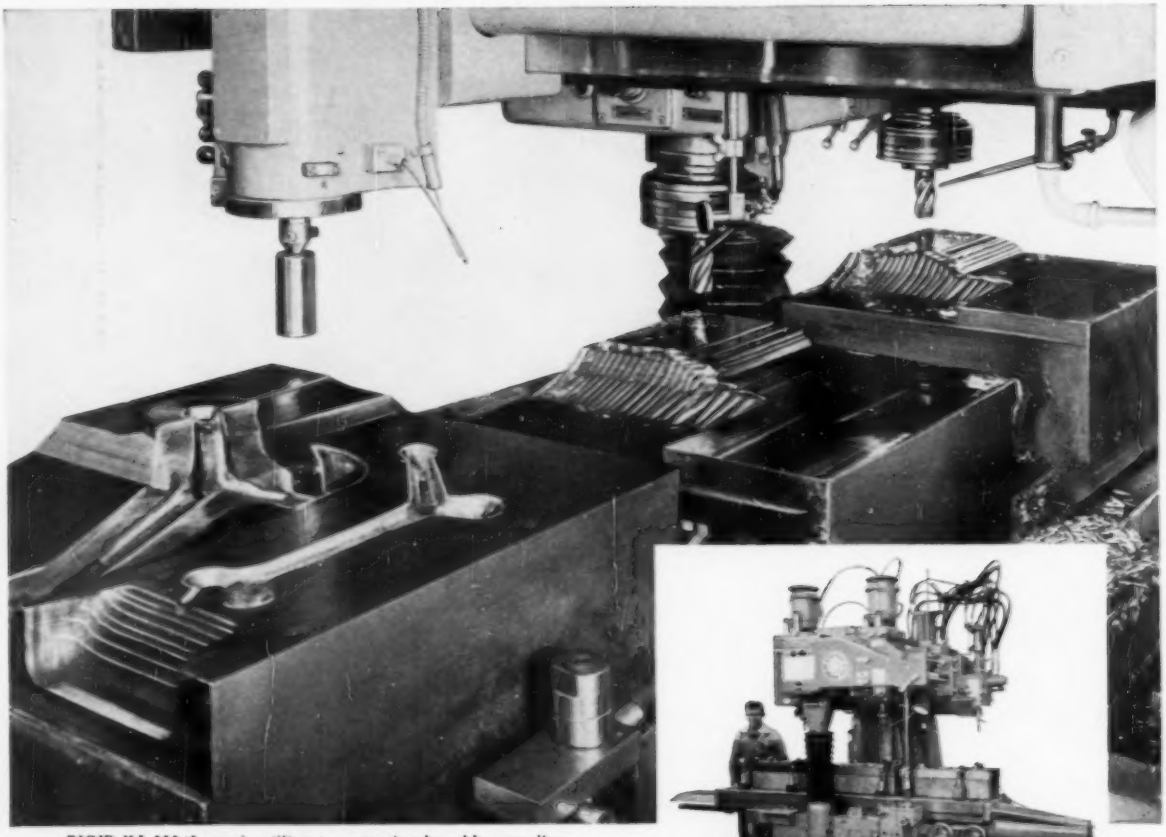
Get the whole story on Starrett Dial Indicators and Gages from your Industrial Supply Distributor. Call him for quality products, dependable service. Or send for Starrett Dial Indicator Catalog showing the complete line. Address Dept. E, The L. S. Starrett Company, Athol, Massachusetts, U. S. A.

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World's Greatest Toolmakers

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RIGID KA-200/2 rough milling two steering knuckle arm dies

RIGID Model KA-200/2

Rigid ***Provides—***

Fully Automatic Die-Sinking Finer Finish, Less Bench Time

A great improvement in accuracy and surface finish—with no increase in cutting time—is possible with these RIGID Die-Sinking and Hydrocopy Milling machines. Fully automatic machining permits a drastic cut in operator's supervision. Accuracy and high surface finish keep bench time to an absolute minimum—in many cases only polishing is necessary. A completely enclosed frame gives the machine tremendous rigidity to handle extremely heavy cuts. The RIGID is available in three sizes with 1, 2, 4 or 6 spindles. Largest copying area is 23⅜" x 39⅞".

OTHER RIGID FEATURES

- Normal Working Accuracy of ±.002" or Closer
- Completely Vertical Copying, Up or Down
- Constant Surface Feed Over Any Contour
- Hand Control for Roughing
- Reverse Image Attachment
- Automatic 360° Profiler With Depth Control (Working Accuracy ±.002")
- Change-over from Transverse to Longitudinal Copy-Milling in Seconds

Write For Additional Information

COSA — *nationwide sales and service of precision machine tools —from bench lathes to boring mills.*

COSA CORPORATION, 405 LEXINGTON AVENUE, NEW YORK 17, N.Y.



Cadillac PLA-CHEK

Height gage and micrometer settings are 5 to 20 times faster with Cadillac PLA-CHEK than with other methods of comparable accuracy. Less than 15 seconds establishes *any* dimension within a 24" range to limits of less than .0001". No auxiliary gage blocks necessary—PLA-CHEK is totally self-contained. Dimensions are taken from the surface plate or from a base line on the work. Send coupon TODAY for complete details!



Cadillac PLA-CHEK Gages are available in a complete range of sizes from the easily portable 6" and 12" models for smaller jobs, to the 18", 24", 36" and 48" models for larger inspections. Precision-made risers in 6" and 12" sizes, such as the 12" model for the 24" PLA-CHEK shown above, may be used with all PLA-CHEK Gages.

MAIL THIS COUPON FOR COMPLETE DATA

CADILLAC GAGE COMPANY
P. O. BOX 3806, DETROIT 5, MICHIGAN
Without obligation please rush complete information on the Cadillac PLA-CHEK Gage line to:

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Company _____

Address _____

City _____ Zone _____ State _____

Cadillac GAGE COMPANY
P. O. BOX 3806 • DETROIT 5, MICHIGAN


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CINCINNATI BICKFORD
Lever Shift
CINCINNATI BICKFORD

CINCINNATI BICKFORD

Super Service Radials

MODERN DESIGN and latest engineering developments built in the ALL-NEW Super Service Radial drilling machines give you *higher production . . . faster, safer operation . . . and greater machining accuracy.* Here are a few of the reasons why:

Exclusive de-clutchable HERRINGBONE DRIVING GEAR provides the necessary power to drive large diameter drills and heavy cutting tools for maximum penetration. When higher speeds are used, such as for small taps, the herringbone driving gear is de-clutched, eliminating excessive velocity.

Three head designs available—*lever shift control* of all 36 speeds and 18 power feeds; *complete hydraulic pre-selection* of speeds and feeds; *hydraulic pre-selection of speeds only*—manual control of power feeds.

A positive safety device is provided in the head traverse mechanism to guard against damage should the head strike the workpiece or other objects during traverse. This safety functions *at any point* of head travel on arm. Head-moving HANDWHEEL DOES NOT REVOLVE when head is being traversed by power.

A pre-loaded, four-bearing, chrome nickel spindle and chromium plated sleeve . . . supported in a *honed head bore* over 17" long . . . assure maximum spindle rigidity, *regardless of position.*

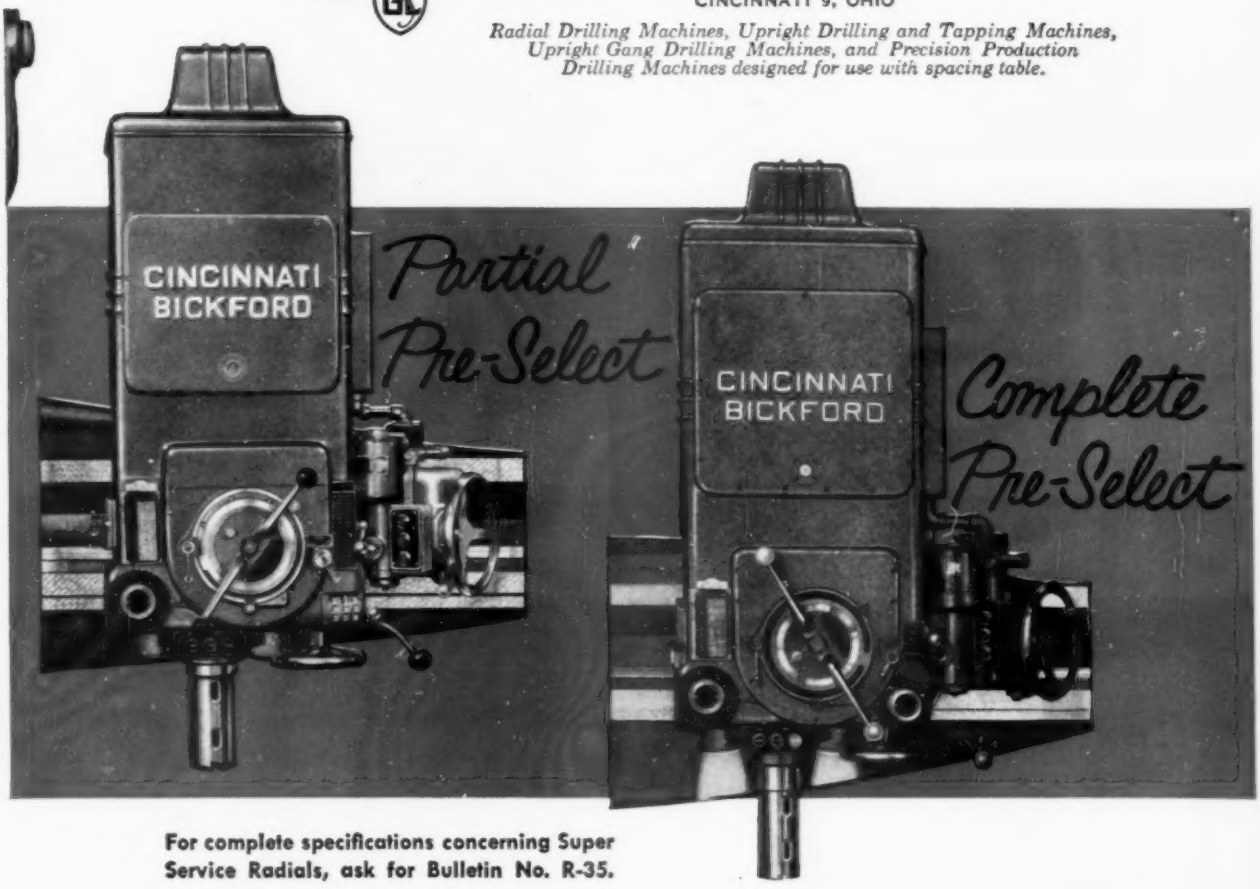
The ALL-NEW Super Service Radials are available with 13", 15", 17" and 19" dia. columns, and 4, 5, 6, 7 and 8-ft. arms. For complete specifications on these powerful radial drilling machines, see your nearest Cincinnati Bickford sales representative.

CINCINNATI BICKFORD DIVISION

GIDDINGS & LEWIS MACHINE TOOL CO.

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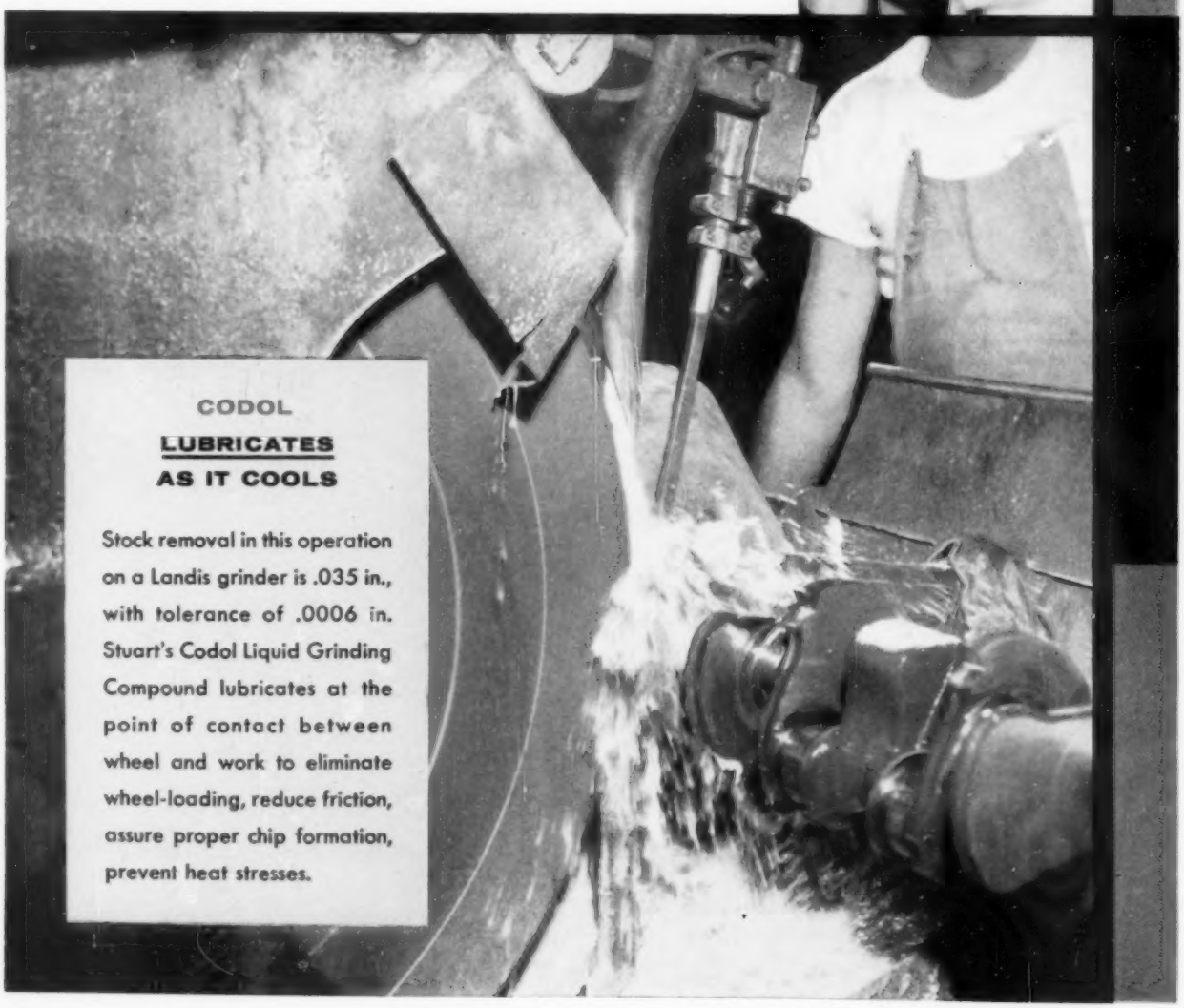
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CODOL
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Stock removal in this operation on a Landis grinder is .035 in., with tolerance of .0006 in. Stuart's Codol Liquid Grinding Compound lubricates at the point of contact between wheel and work to eliminate wheel-loading, reduce friction, assure proper chip formation, prevent heat stresses.

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HERE'S WHAT THEY SAY ABOUT STUART'S CODOL:

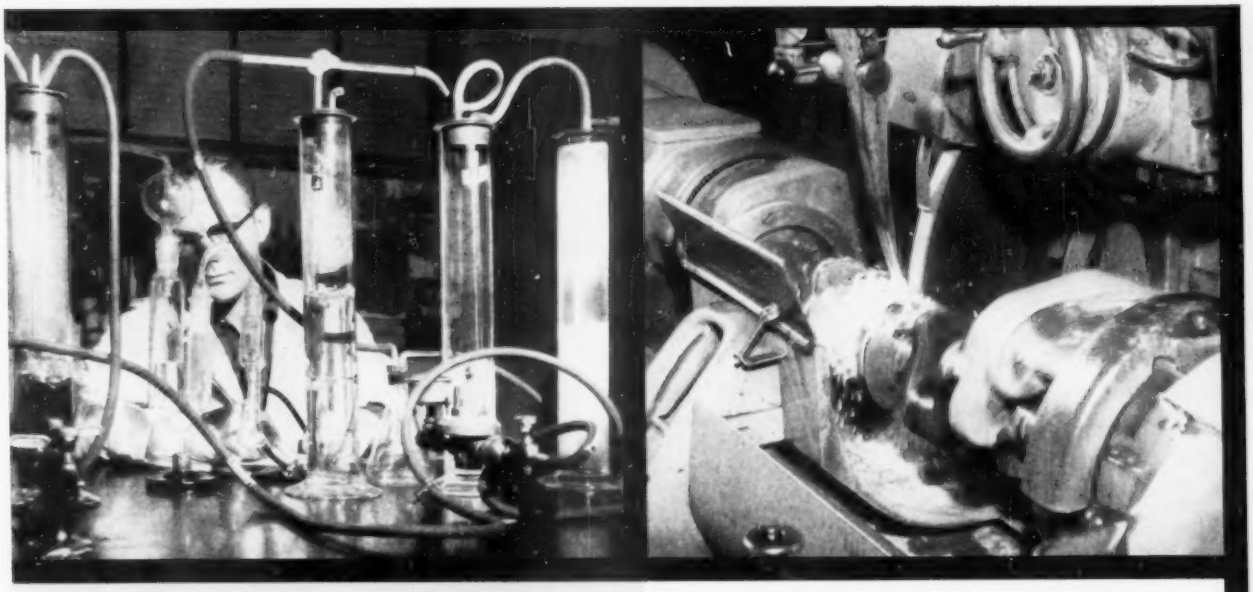
"The wheel doesn't load up as it did before . . . finish is much improved . . . work runs cool, and this gives us improved accuracy . . . gives us more cuts per wheel."—grinding machine operator

"Wheel-loading and burning used to be serious problems. Now, we get better corners and no burning of the side wall. Codol permits us to run without pumping until the tank is almost full of sludge."—foreman

"Now we have no rusting whatever. Another point—we leave our Codol standing over the week end and have no worries about its deteriorating and going rancid"—grinding machine operator

The plant's engineering laboratories tested numerous coolant materials and reported Codol to be unsurpassed as a remedy for the wheel-loading problem.

Codol eliminates tearing and scratching of the finish and has earned full credit for a marked increase in wheel life on thirty grinders throughout the plant.



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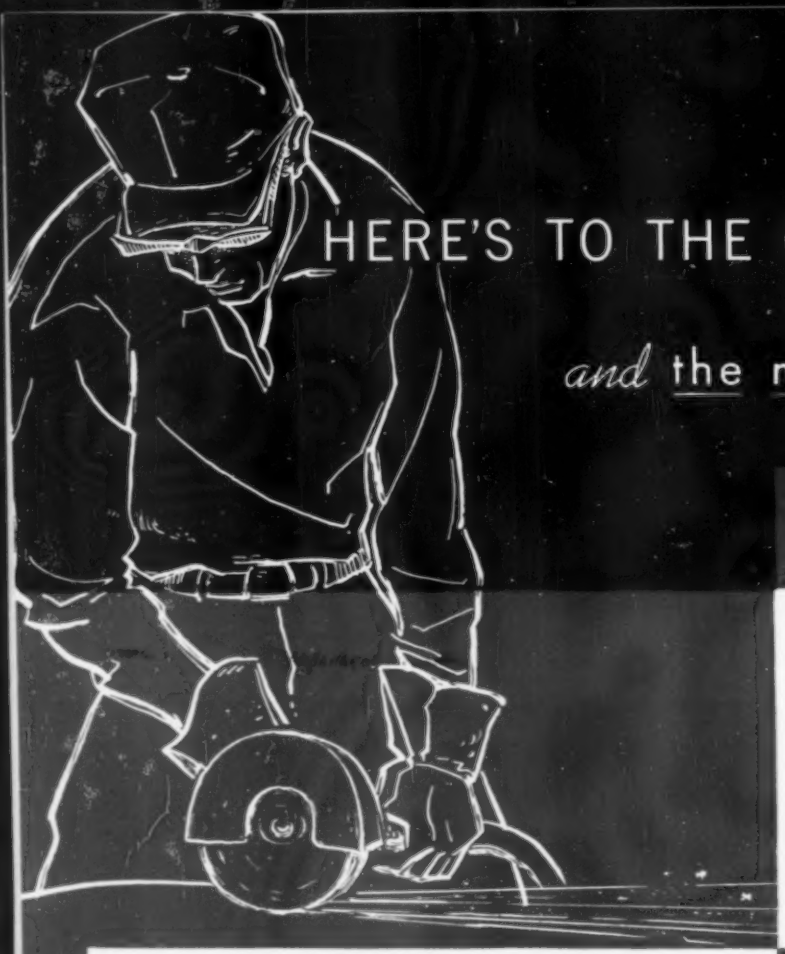
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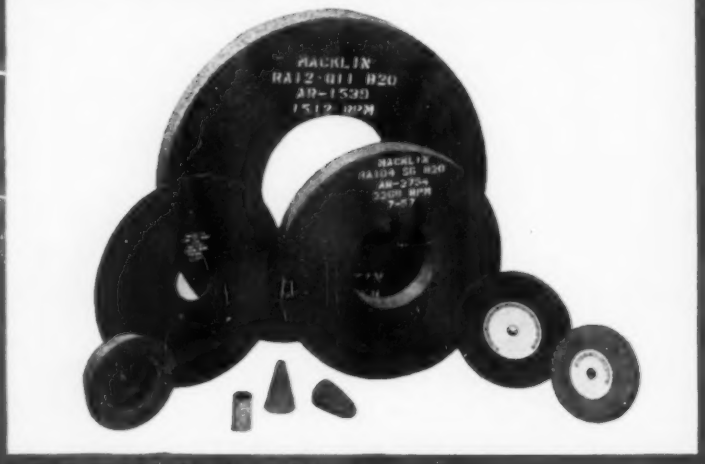
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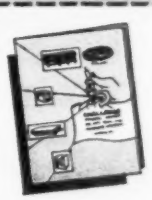
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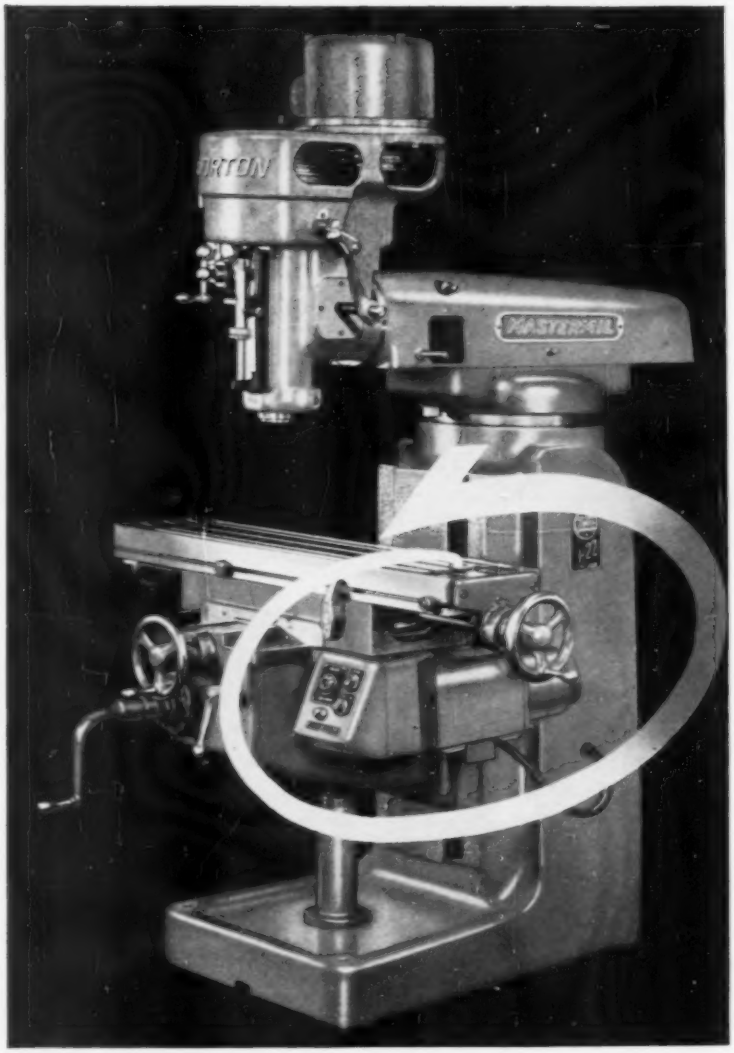
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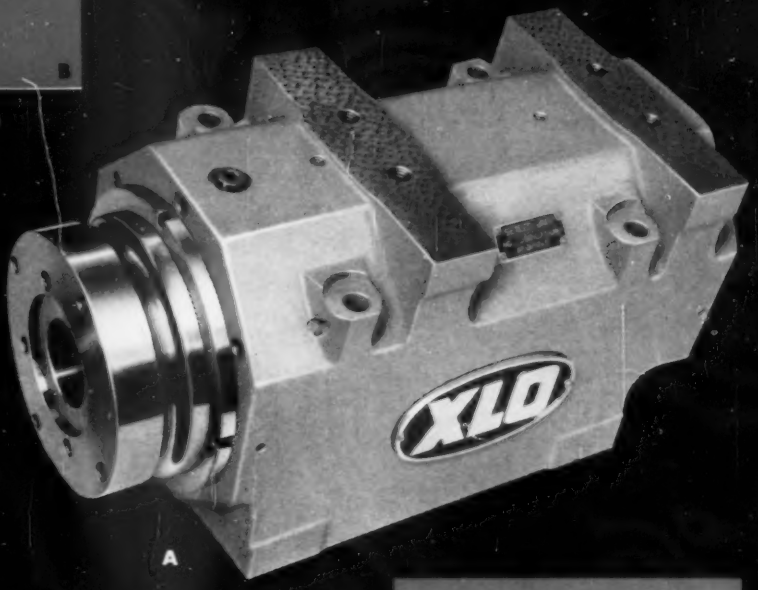
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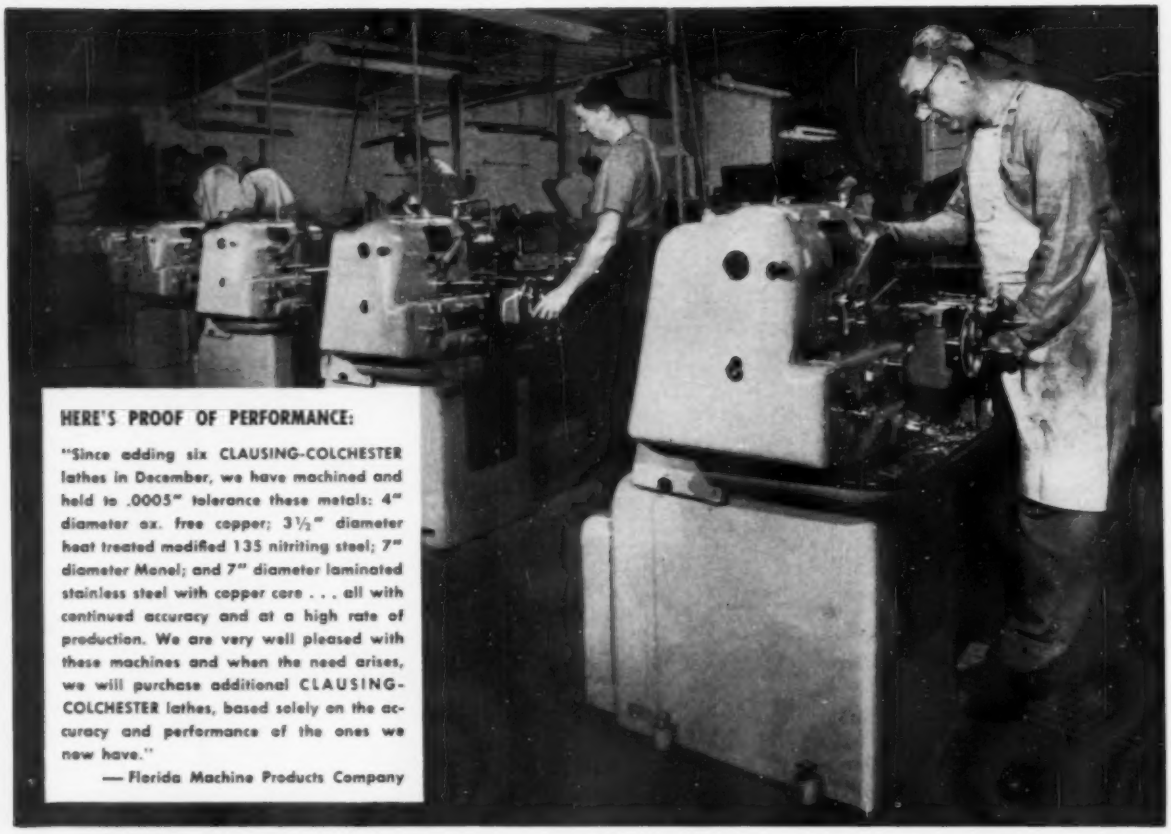
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17" lathe: 54" and 78" centers, 28" swing in gap; 15" lathe: 30" and 48" centers, 24" swing in gap; 13" lathe: 24" and 36" centers, 18" swing in gap.

SPINDLE CAPACITIES

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Thru-Hole	3-1/16"	2-1/16"	1-9/16"
Nose Taper Key Drive	L-2	L-1	L-0

BEARINGS

Lathe	17"	15"	13"
Front Spindle Bearing O.D.	7-1/2"	5-1/2"	4"
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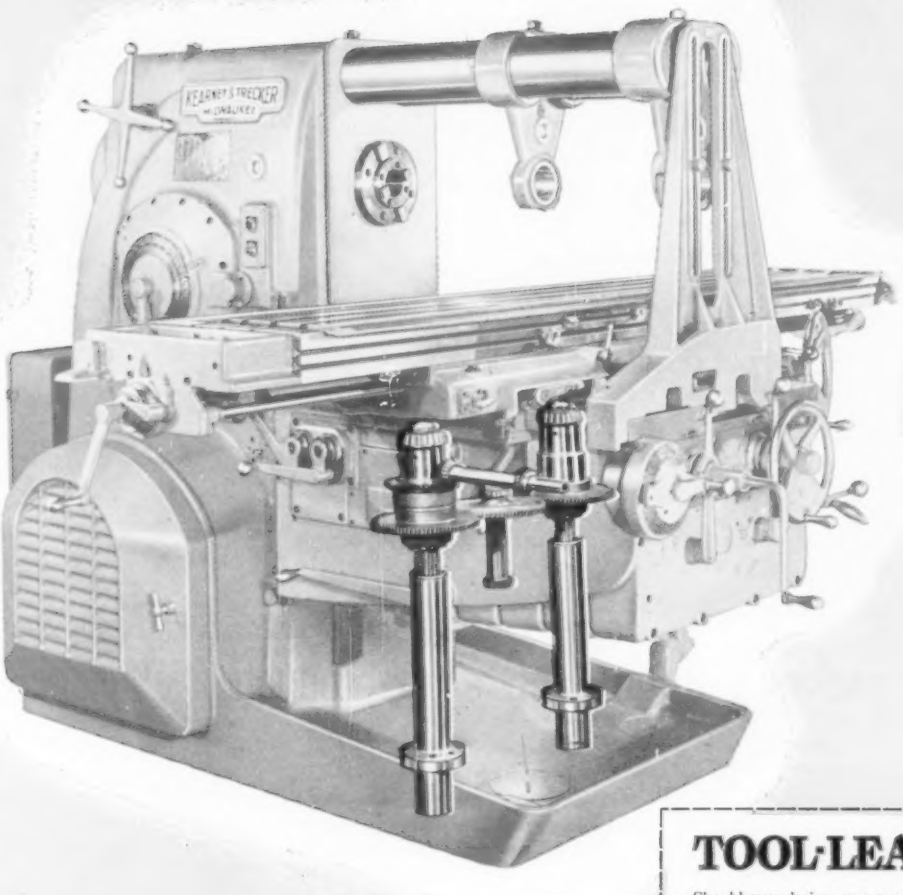
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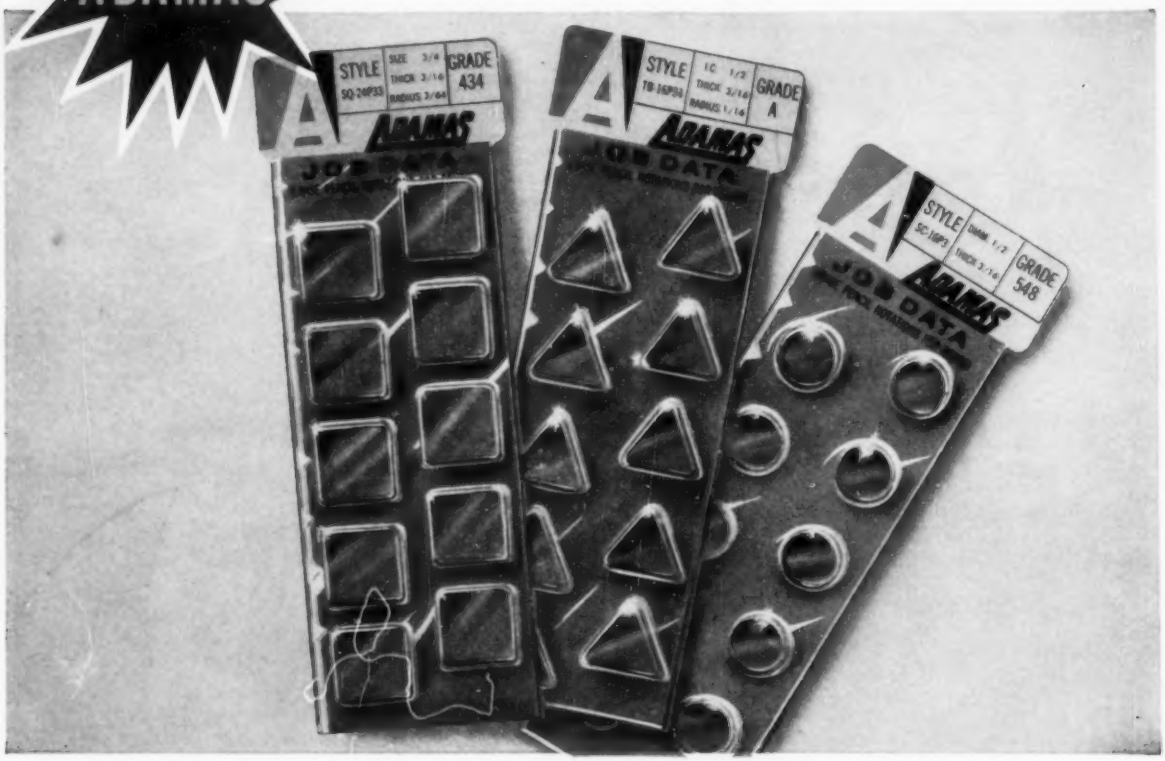
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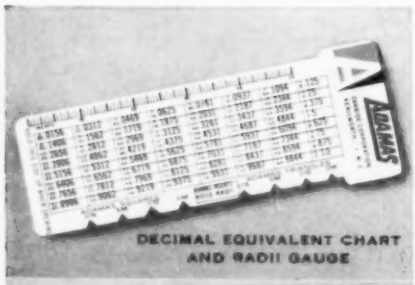
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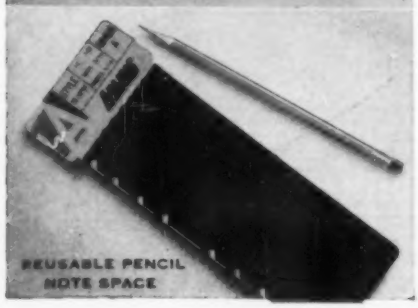
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Automation

The word automation has been foremost in the mind of tool engineers for many years. There is hardly an idea, a process, or a method conceived without the thought of automation.

The definition in Webster's Dictionary is a complete one. However, the one that the tool engineer uses in his daily work is that automation is a process for moving, machining, and inspecting material without human drudgery or effort. It is a method for eliminating in-process storage of material, and consequently, a method of controlling quality, accuracy and cost. Automation is the natural developments and improvements in mechanization. The word itself implies the ultimate.

Many questions have been asked concerning the English and European engineers' thinking regarding automation. Basically their methods and problems are similar to our own except for the economic values, which are entirely different. In view of this difference, automation has not progressed as fast in Europe as it has in this country. In Europe, the supply of good craftsmen comes from excellent training systems for apprentices, and with labor rates such as they are there, it leaves very little returns for developing automation as an economic measure. However, practically all plants have what we term segmented automation. This includes phases of automation, such as automatic loading and unloading, automatic feeding, automatic gaging, and keeping the workpiece in process between machines.

The viewpoint of labor and management in Europe appears to be healthy. Labor knows that its product must be of the highest standards and sold for a low price in order to compete with world markets. Both labor and management realize that their products must be exported and sold in order for them to survive, as they manufacture products in excess, far beyond their domestic requirements.

Automation will continue to develop all over the world as the supply of skilled labor decreases and the labor rates increase, making it only natural to remove drudgery and repetitive tasks from industry, accelerating the increasing trend toward automation.

H E Collins

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new approach to

REPLACEMENT STUDIES

By B. A. Margo
Management Consultant
Montreal, Canada

INFLATION accentuates the basic difficulties connected with the fluctuating purchasing power of money. These difficulties do not affect all business enterprises to the same extent. Therefore, it is understandable that there is little general interest in changed systems of bookkeeping, in new methods of preparing financial reports and in new ways of determining rates of depreciation.

Drastic changes cannot be expected in the foreseeable future, despite the fact that rules on depreciation are now under scrutiny. This situation poses various problems which will be discussed in this article. In particular, a novel replacement study method will be explained.

Fluctuating Purchasing Power of Money: *Fig.* 1 shows how the purchasing power of the dollar fluctuated over a period of 90 years. It shows that purchasing power has been relatively stable during certain periods. However, it is fair to say that it has fluctuated widely and rapidly most of the time.

This observation has to be reconciled with the first monetary postulate of accountancy: "Fluctuations in value of the monetary unit, which is the accounting symbol, may properly be ignored." (Quoted from *Changing Concepts of Business Income*, The MacMillan Co., 1952.) This postulate is still the basic concept of accounting. It is also reflected in the existing regulations pertaining to depreciation of capital goods. Consequently, numerous companies find that the depreciation permitted by tax regulations is frequently not sufficient to buy replacements in kind.

Some of the confusion surrounding depreciation policies stems from the fact that the expression *depreciation* is applied to problems which have nothing to do with replacements. Therefore, the use of the word *replaciation* is recommended for use in replacement problems. The following comparisons will illustrate the value of the meanings of the two words:

Depreciation	Replaciation
Definitions	
Depreciation is the act of lessening value or worth, as of property; or a fall in value	Replaciation has to do with the anticipated cost of replacements which should normally be earned by including appropriate amounts in the selling prices of the products.

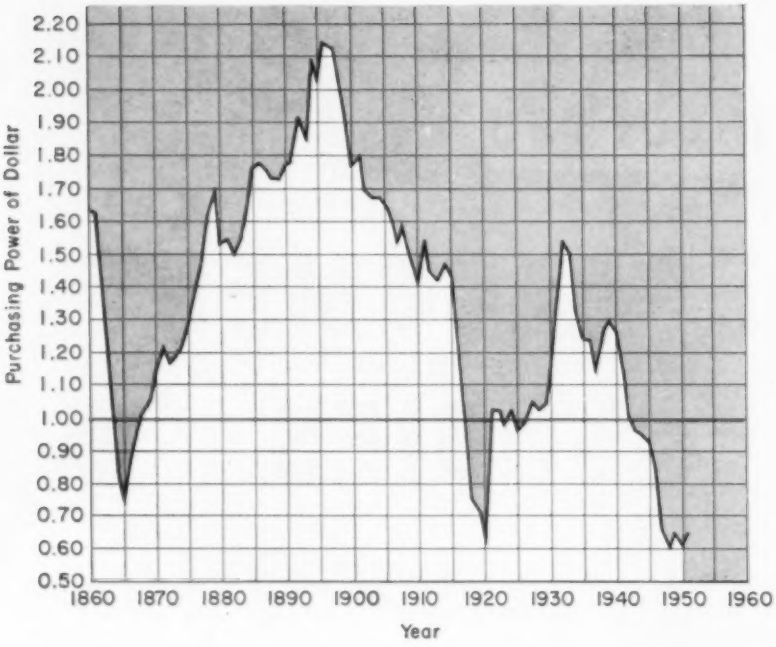


Fig. 1. Purchasing power of the dollar from 1860. Chart is based on the Wholesale Index as published by the Bureau of Labor Statistics (1926 = 100).

Courtesy
Dun & Bradstreet, Inc.

Applications

Depreciation shall take care of the diminishing value of certain assets, some of which are not replaceable

Replaciation is applicable to all resplaceable assets, costing and pricing, replacement studies, and financial budgets

Time Factor

Depreciation has to do with money spent in the past

Replaciation has to do with money to be spent in the future

Jurisdiction

Depreciation is under nearly complete jurisdiction of tax authorities

Replaciation is under complete jurisdiction of management

Establishing Rates

With some exceptions, depreciation rates are limited according to *Bulletin F*, IRS Publication No. 173, now under revision, which is based on past experience, average conditions, the assumption of stable money and unchanging technology

Replaciation rates can be established to suit the characteristics of individual assets; they can be adjusted, even retroactively, at any time to suit anticipated changes of life expectancies and purchasing power of the dollar

Effects

Unrealistic depreciation rates have led and would continue to lead to overtaxation and loss of capital during price inflation. They would have the opposite effect during deflation.

The concept or replaciation may lead to more reliable selling prices, better financial control and preservation of capital. It is a measure of depreciation and may help show the inadequacies of the present system.

Estimated Cost: The distinction between the concepts of depreciation and replaciation has several advantages. One of them is that the calculation of selling prices will be concerned with estimated future cost only. *Fig.* 2 shows a specimen of such a price calculation. Until now, depreciation has been considered as a part of cost, a concept which resulted in difficulties because of the fluctuations of the purchasing power of money and the rigidity of tax regulations. The inclusion of replacement charges in a cost estimate, on the other hand, gives management complete freedom of action.

Actually, there will be replacement charges for every replaceable asset. In a cost system using departmental overhead percentages, these charges would be part of the departmental overhead. The only exception would be nonreplaceable assets for experimental or similar, once-occuring uses. The cost of such assets would have to be recuperated by an appropriate application to unit cost which will depend upon the prevailing cost system.

Ideal Setup of Depreciation Taxation: It stands to reason that a table of life expectancies as established in *Bulletin F* can be adequate for average conditions of the past only. It cannot take care of changing trends in technology, varying operating conditions and changing purchasing power of money. These are factors which can be judged only by management. It is the responsibility of management to watch these trends and to safeguard the capital structure of the business. It is not conceivable that a government can take over such a responsibility. Consequently, management should

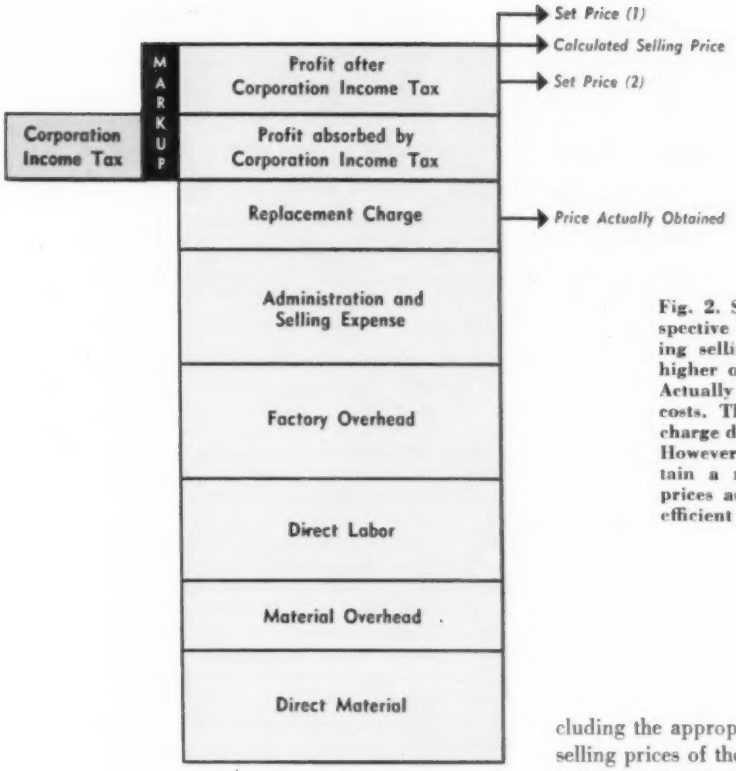


Fig. 2. Specimen Price Calculation. Irrespective of the methods used in calculating selling prices, the set price may be higher or lower than the calculated one. Actually obtained price may not cover all costs. The application of a replacement charge does not alter this daily experience. However, it may help management to obtain a more reliable picture of selling prices as needed to keep facilities at an efficient level.

be free to set depreciation rates for individual assets to suit the factors mentioned.

This implies that two records should be kept for depreciation; one in nominal dollars of original cost, the other in amounts adjusted according to the varying purchasing power of money. A similar system has been in use in Sweden for many years. It required correction some time ago because it gave too strong an incentive for investment in new machinery, etc. It had an inflationary effect. However, it is not too difficult to design a system which would prevent this possibility.

Replacement for a New or Proposed Asset: Calculations have to be done in round figures because the underlying assumptions cannot be 100 percent correct. For example, an engine lathe costing 15,000 nominal dollars in 1957 will be disposed of in 1967 after having been used for production only. The assumed salvage value is 10 percent of its original cost or 1500 nominal dollars. Further, an assumed replacement in kind will cost 35 percent more in 1967. Then, 1.35 x 15,000 or 20,000 nominal dollars is the amount of money needed in 1967. Part of it will be available from the salvage value which will amount to 1.35 x 1500 or 2000 nominal dollars. Therefore, it will be necessary to accumulate 18,000 nominal dollars during 10 years by including the appropriate replacement charges in our selling prices of the manufactured products.

The calculation of the annual replacement rate consequently is simply the following:

$$(15{,}000 - 1500)\ 1.35 = 18{,}000$$

This divided by 10 becomes $1800 for each year, in round numbers. These are dollars of diminishing purchasing power.

The 35 percent figure may be based on an assumption of an increase in the general price level or a specific increase as measured by a special price index. It would be up to the cost accountant or analyst, who calculates replacement rates, to watch such indexes and to make adjustments of replacement rates. He can even do this retroactively to cover the entire period of use.

Replacement for an Existing Asset: The calculation of an annual replacement for an existing asset is a little more difficult and may require compromises. This situation is similar to the introduction of a pension plan in a company with many relatively old employees. For example, it may be assumed that a turret lathe was bought in 1950 for 18,000 nominal dollars. Now, it is necessary to reconstruct what would have been done at that time in order to arrive at the annual replacement rate. It could have been assumed that this machine would be replaced after 15 years of productive life, i.e., in 1965. Further, it would have a salvage value of 15 percent or 2700 of 1950 dollars. Finally, the as-

REPLACEMENT STUDY WORK SHEET

1. **Production Estimate**

   The proposed equipment or method is expected to operate on a 1 - 2 - 3 shift basis in department ..... at ..... % capacity for the next ..... years.

2. **Estimate of yearly Direct Labor costs**

Product		Part	Parts per Product	Pieces per Year	Dir. Labor per part		Yearly Costs	
Name	No.	No.			Present	Proposed	Present ($)	Proposed ($)
						Subtotal 1		

3. **Estimate of other costs**

A. Indirect Labor		
cleaning and lubricating		
down time		
fringe labor costs		
holidays and vacations		
maintenance: routine		
: prorated		
material handling		
overtime		
rework		
scrap handling		
setup time		
shift premiums		
supervision		
B. Indirect Material		
cleaning and lubricating		
electrical		
fixtures and jigs		
scrap		
spare parts		
tools		
C. Other Costs		
replacement charges		
electricity (power, light)		
rent		
royalties		
subcontract costs		
taxes and insurance		
D. Redistributed Costs		
top management		
shop management		
personnel department		
engineering department		
payroll department		
inspection department		
production control		
plant engineering		
toolroom		
boiler house		
Subtotal 2		
Grand total		
Savings $/year		
Return on investment, %		

Other advantages: _____

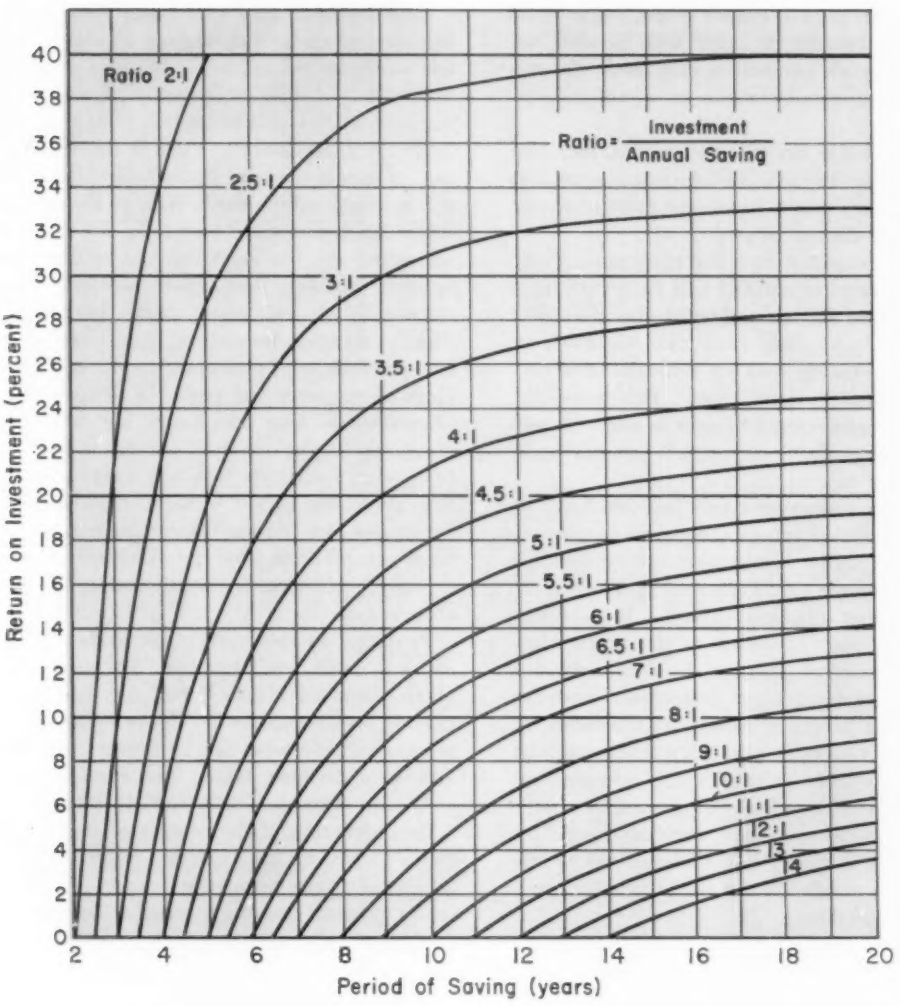


Fig. 3. Chart showing rate of return on investment based on various ratios of investment to annual savings. The year scale indicates the period during which the savings are expected.

sumed prices of such machines would be higher by 30 percent in 1965.

Consequently, the calculated annual rate is as follows:

$$\frac{(18{,}000 - 2700)\ 130 = 1300}{15}$$

This would be a conservative approach, inasmuch as this machine may have been written off to some extent.

Replacement Charges in Replacement Studies: The specimen Replacement Study Work Sheet shows replacement charges under "3— Other costs." These charges would have to be entered for the existing as well as the proposed equipment.

This procedure is based on the assumption that the existing machine in question is still working and may still contribute all or part of the savings which were the motive for its purchase. This machine may have to be kept in service for additional years, if the study shows that the proposed machine does not offer sufficient advantages to warrant its purchase. Consequently, the future cost of operating the existing machine is estimated by using past experience as a guide. The future costs, if the machine is kept in operation, must include the replacement charge.

The listing of estimated future costs for the existing and the proposed machine is the first question. Doing this, it is necessary to consider possible changes in "true" labor cost which may occur, e.g., if the work hours are shortened by equal pay rates. The next operation is to calculate the estimated savings. Afterwards the return on investment is deter-

mined from the Rate of Return graph, *Fig.* 3. This return on investment, together with possible additional, intangible advantages, may justify the purchase of the proposed machine as a profitable investment.

If it is decided to buy the new machine, then, and only then, is the disposition of the existing machine considered. Only then is its salvage value of significance. This is the second step.

It may be expected that the application of replacement charges as outlined will normally lead to higher estimated savings and returns on investment than obtainable by other study methods which assume that the existing asset has a salvage value only and corresponding capital cost. This possibility should be of equal interest to users as well as to sellers of capital goods.

Return on Investment and Income Tax: As long as depreciation can be charged as an expense, thus reducing profits, some money can be saved on corporation income tax. Such savings would make a new investment still more attractive. If so desired, these savings may be added to those previously calculated. However, this can be done only if a constant rate of depreciation is assumed. However, there exist two factors of uncertainty which deserve consideration. One is the possibility that a company may at times operate at considerably less profit or even show losses. The other one is a possible change in tax rates. Since many new assets are bought for many years in advance, it is advisable not to lose sight of these possibilities in the purchase of new production equipment.

Rate of Return Graph: If an investment of $1000 will give us an annual saving of $250, the ratio of investment to saving becomes $1000 divided by $250 or 5:1. If this investment lasts only four years, the graph in *Fig.* 3 shows a return of zero percent. This means that the annual savings of $250 were just sufficient to give a return of the initial investment. If the equipment is used for a longer period, the return on the investment reaches a theoretical maximum of 25 percent at infinity years. At that point the investment may be considered as completely repaid and the annual saving would be interest only.

This graph is based on present worth factors which may be found in textbooks on engineering economy. It shows that the pay-back method may present a misleading picture. This method considers only how many years it would take to obtain a return of the investment. The implied assumption is that the investment would be kept in service for a longer period. However, depending upon the ratio, this period has to extend a definite number of years before the return on investment becomes attractive to the company.

Obsolescence and Obsolete: Dictionaries define obsolescent as "passing out of use" and obsolete as "gone out of use." In daily usage, these words have a different meaning. For instance, a machine which is still in use may be called obsolete. The tacit understanding is that it should be out of use for certain reasons. In the following discussion this meaning will be used. Rate of obsolescence is one of the factors which have to be considered when estimating the life expectancy of an asset. Such estimates—as have been shown—are needed for the calculation of replacement rates. In this age of rapidly changing technology, there exist innumerable possibilities of substantial improvements on all kinds of machines and pieces of equipment. Such improvements may take years for development; sometimes they arrive from one day to the next, so to speak. Sometimes they are based on entirely new principles as for instance chemical milling. Sometimes such innovations can be foreseen, sometimes not. All these facts are well known and speak strongly against the assumption of a straight-line obsolescence.

However, another factor has to be considered which is easily misunderstood. The very existence of an improved machine does not make another existing machine obsolete! This is not an automatic process. Obsoleteness can be decided only by the user of a machine, taking into consideration the particular circumstances of his operations.

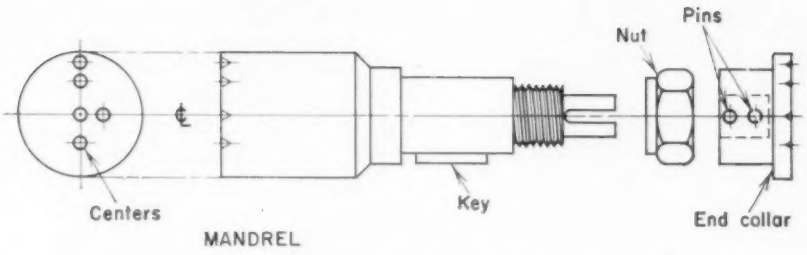
One advantage of the concept of replaciation is that estimates of life expectancies can and should be altered at any time, even retroactively, if it becomes apparent that the original or last estimate is no longer valid. One of these reasons can be a different situation affecting the obsolescence of the machine.

Summary: In this article a novel approach to replacement studies has been explained. This method permits the performance of such studies without any recourse to difficult conceptions. It puts the emphasis on an estimate of future costs. One of these cost factors is the prorated anticipated cost of replacements which, in the normal course of a business, have to be earned by means of appropriate selling prices for goods or services.

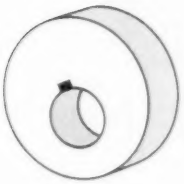
The calculation of replacement rates embodies the same thoughts which may be applied to an ideal method of determining depreciation rates for taxation purposes. Both suggestions have the important advantage of flexibility which is most desirable because of the fluctuating purchasing power of our money and rapid changes in technology. In applying these suggestions, management would be enabled to set replacement and depreciation rates to suit changing operating conditions of individual machines, a feature of special interest to industry, especially in a competitive situation.

Gadgets

Ingenious Devices And Ideas To Help The Tool Engineer In His Daily Work



Mandrel for Machining Cams



Machining of cams, throws and other eccentric parts is facilitated by the mandrel illustrated. Construction details are evident from the drawing. Workpieces are reamed to fit the mandrel and have broached keyways to hold them in position. It is possible to machine several different throws by changing to different centers, and the mandrel can be made long enough so that several cams can be machined at the same time.

Charles Spicer
Grand River Valley Chapter

Portable Height Gage*

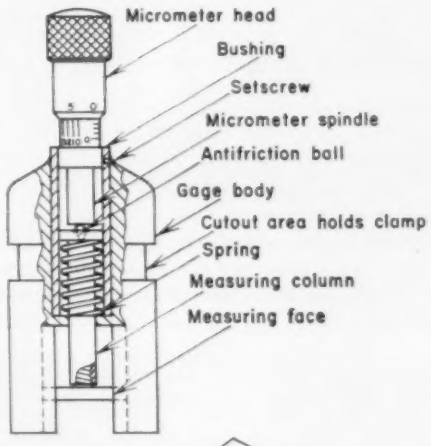
Checking the height of projections on a workpiece can be a time-consuming operation, since it often involves the use of size blocks. If the measurement is made with the workpiece on the machine table, it is necessary to continually remove and replace the blocks. Under such conditions, the portable height gage illustrated saves time and gives reasonably accurate measurements.

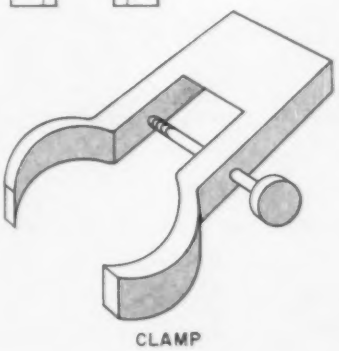
The body of the gage is of stainless steel. A commercial micrometer fits into a bushing in the gage body, and is held in position with a setscrew. One end of a measuring column also fits in the bushing. A spring holds this shaft in the up position. A measuring face at the bottom end of the shaft contacts the workpiece. A steel ball between the micrometer spindle and the measuring column prevents the rotary movement of the spindle from being transmitted to the measuring column.

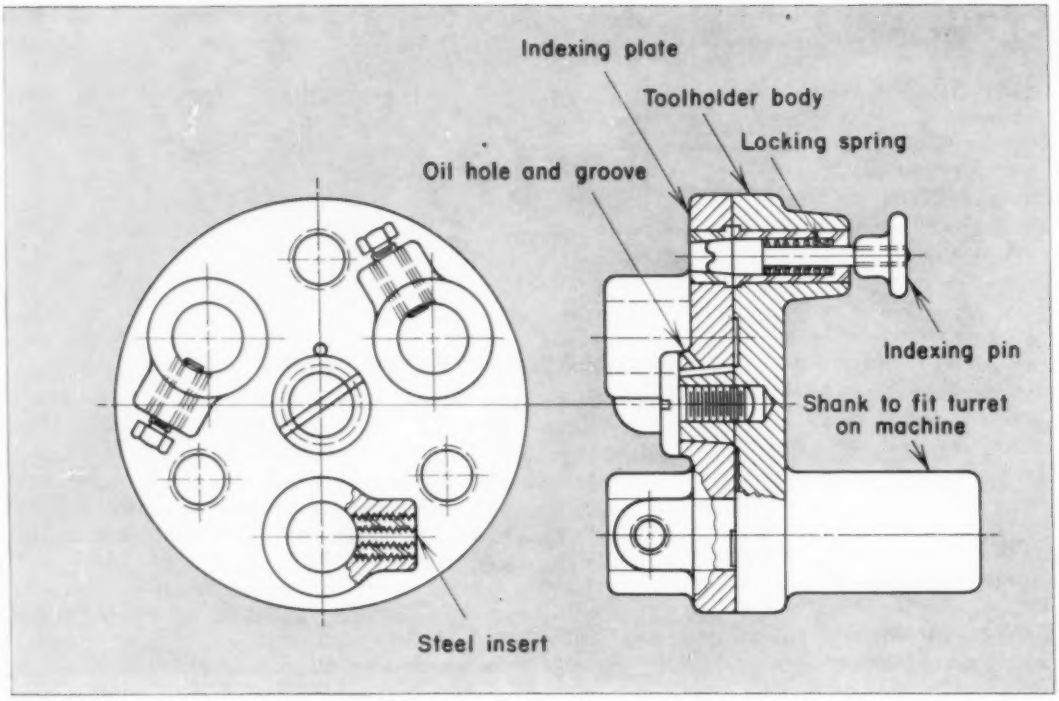
A clamp such as the one illustrated is a handy accessory, since it can be used for mounting the gage on an angle plate at any desired height. Accuracy of the gage is dependent on the care with which it is made. With a well-made gage, accurate readings can be taken in increments of ten thousandths of an inch.

Thomas J. Bizzoco
Greater New York Chapter

*Gadgets Contest Entry







Indexing Turret Toolholder*

In turret lathe work, there are occasions when additional holes are required in the turret. The toolholder illustrated provides two additional holes to hold tools for light operations such as drilling, chamfering and reaming.

The device consists of a body with a shank to fit a hole in the turret and an index plate with three holes to allow tools to be brought in line with the center of the work. A pin holds the index plate in position for each operation.

The body and index plate are of cast iron. Tools are retained in the holes in the index plate by steel setscrews. These turn in threaded steel bushings. Because of its simple design, the toolholder is easy to construct and operate.

Wm. W. Johnson
Cleveland Chapter

*Gadgets Contest Entry

Contributions for these pages describing short cuts for the tool engineer are welcome. Finished drawings are not necessary. Payment is made upon publication.

Built-In Indicator*

When machining an "L"-shaped iron casting in an engine lathe, operators found it difficult to hold the required accuracy. An inside face of the casting is machined with a special back-facing boring bar. The distance from the inside face to the center line of a bored hole in the base of the casting must be accurate to within 0.001 inch. Originally, this distance was checked with an inside micrometer, measuring from a locator stud mounted in the base of the face-plate fixture which holds the job during machining.

Because the micrometer method was awkward and gave uncertain results, it was decided to build a

swinging arm into the fixture, to hold a dial indicator. A setting gage for the dial indicator is permanently mounted to the fixture. When the fixture and work are rotating, the dial is nested into the setting gage to keep it free from the back-facing tool. A spring clip holds it in position. Details of the construction of the fixture and swinging arm are evident from the accompanying photographs.

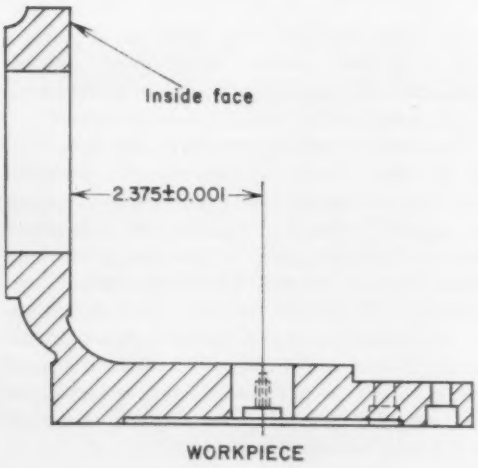
In operation, the surface is first roughed out. The operator then begins to take trial measurements with the dial indicator. Machining is halted when dial indicator "zeroes out" on the machined surface.

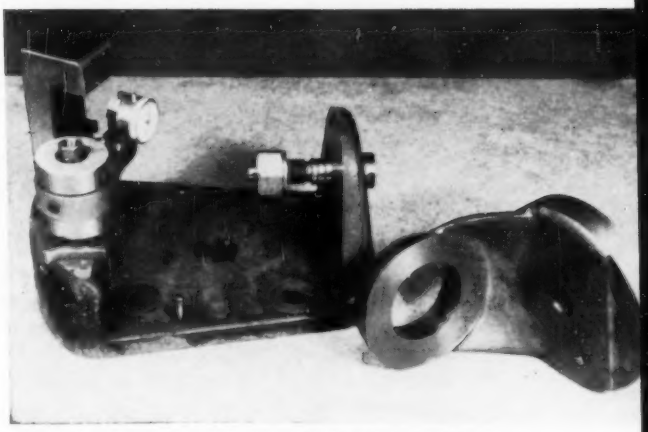
Accuracy of this gaging method is dependent, of course, on the accuracy and ruggedness of the swinging arm and the fixture itself. The swinging arm assembly turns on a pair of high-precision radial and thrust ball bearings which are preloaded against each other. Bearing housings and the shaft are heat treated and ground to size. Presetting of the setting gage is accomplished with gage blocks, measuring from the center location stud in the fixture base.

In production, the "built-in" indicator has performed well. The dial indicator is easier to read than a micrometer and the swinging arm facilitates measurement.

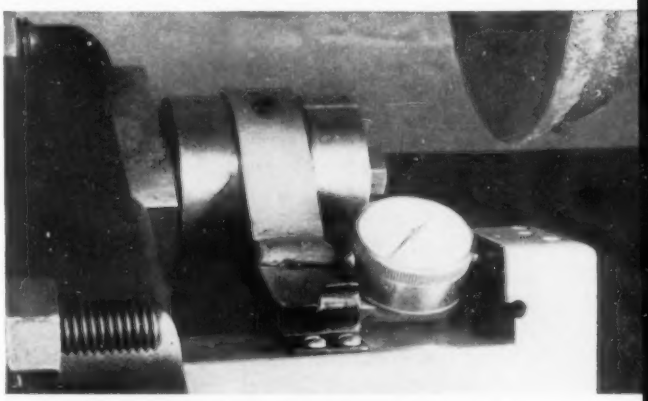
H. J. Gerber
Member-at-Large
Stillwater, Okla.

*Gadgets Contest Entry

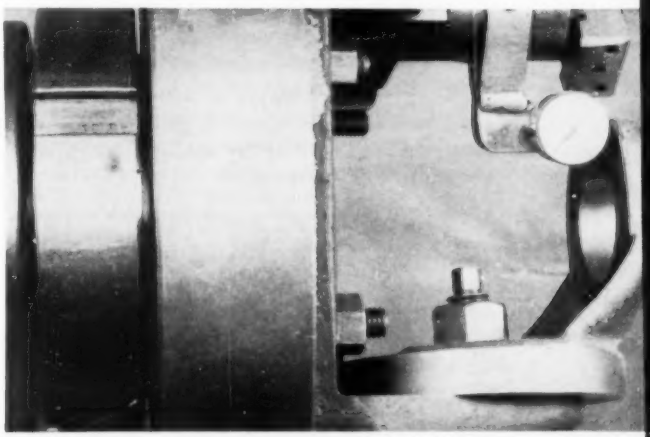




Fixture removed from lathe. A finished workpiece appears to the right of the fixture.



Dial indicator nested in setting gage. Spring clip holds it in this position during machining.



Dial indicator in position for checking workpiece.

CO_2 Welding of Steel

...process increases welding speed and reduces cost

By R. W. Tuthill
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Welding with a blanket of CO_2 to shield the weld provides economical joints and facilitates manual welding by making the process visible to the operator.

SURPASSING the older and well-established methods of welding steel, CO_2 welding can economically deposit large quantities of steel at high travel speeds. Using a blanket of carbon-dioxide gas instead of flux to shield the arc, this method employs relatively small-diameter, bare electrodes. This inexpensive, readily available gas, eliminates the equipment needed for flux handling and recovery.

The welding process uses high current densities on $\frac{3}{64}$, $\frac{1}{16}$ or $\frac{3}{32}$-inch diameter solid electrodes. The current density approaches 100,000 amperes per square inch and is usually five to ten times greater than that used on manual flux-covered electrodes. For instance, 300-600 amperes are used on a $\frac{1}{16}$-inch diameter electrode. This current density is employed to get desirable arcing characteristics. High rate of deposit, fast travel speed, greater depth of penetration and self-regulating characteristics of the arc are obtained as a result of the high current density.

Welding can be performed either with a hand

gun, where the manipulation of the electrode is done manually, or by machine, where the automatic head is fixed and the work moves or vice versa. In manual welding, electrodes cannot be used in rod length or stick form but are supplied as a wire in coiled form fed through a hand gun, *Fig.* 1, by a mechanical-feeding device.

This reduces the basic-skill requirements compared to conventional manual welding. The operator does not have to feed the electrode while he moves it along the work as the weld progresses. Because of the high current density, the arc voltage has little effect on the burn-off rate. Arc current alone controls the burn-off rate. Since the wire-feeding speed and burn-off rate must be equal, the mechanical wire-feeding device actually controls the current. The ordinary welding machine only adjusts arc length, not current, and is not well suited to power this process. Welding machines for CO_2 welding are made especially for the process and are calibrated for welding with constant arc lengths. This simplifies the adjustments that the operator must make and completely separates them from one another. This minimizes the setup time and training time for new operators.

Carbon dioxide is recommended for welding carbon steel. Some applications use carbon-dioxide gas for welding stainless steel. Most welds on stainless steel are best made with mixtures of argon and oxygen or argon and carbon dioxide. For production welding of mild steel, either manually or automatically, the carbon-dioxide consumable-electrode gas-shielded welding process may be the economical answer. Cost comparisons between manual stick-electrode welding and manual carbon-dioxide welding, and then comparison between automatic CO_2 welding and submerged-arc welding will indicate the cost considerations. If the material is 14 gage or heavier, if the welding is repetitive and if considerable welding time is needed compared to the setup time, then semiautomatic CO_2 welding may be desirable. One of the advantages of CO_2 welding is the absence of fused flux which would be time consuming to remove. Since the electrode is supplied in a coil form instead of fixed-length electrodes, there is no natural tendency to stop welding about once a minute to change electrodes and clean flux. Good usage of electrodes occurs because no stub-end losses are encountered.

Desposited metal for consumable-electrode welding costs approximately twice as much as in manual stick-electrode welding. However, the main cost of welding is labor cost. It is possible to weld two to six times faster using a semiautomatic gun and carbon dioxide than with conventional electrodes.

Cost of gas-shielded welding equipment is about four times as large as manual stick-electrode investment. The gas-shielded equipment is more bulky and cannot be manipulated as readily as stick-electrode equipment. Also, it is usually limited to a smaller work area of the requirement of mechanical feeding of the wire. Out-of-position welding can be done faster with the new process than with stick electrodes but, like any other welding process, faster speeds are possible with positioned work.

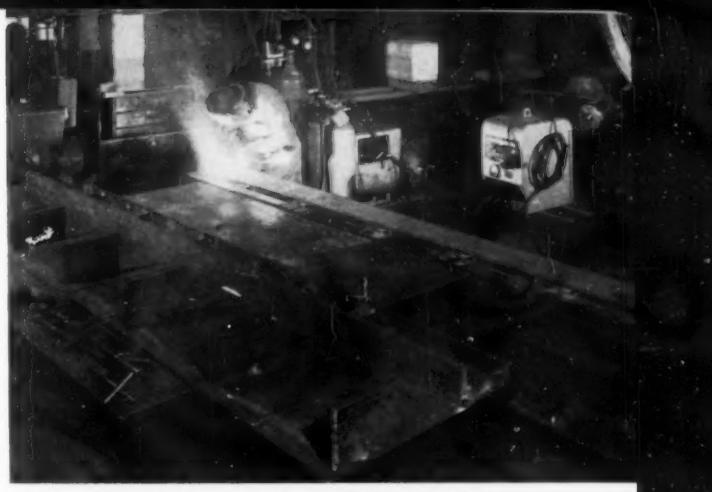


Fig. 1. Manual welding using carbon dioxide to shield the arc.

A typical application of manual welding is shown in *Fig.* 1 where a steel battery assembly table is being welded with CO_2. This job is of significance because it eliminated a three-hour straightening job that used to be needed when the table was welded by manual stick-electrodes. The welder used is a constant-arc-length type. *Fig.* 2 shows a railroad car being welded. The wire-drive unit, which houses the motor for pulling the wire, and the coiled wire are mounted on a dolly to run the length of the car. One of the main joints is shown in the insert. Welding speed on the job is 20 times faster than the previous method using stick electrodes. Submerged arc could not be used, nor could powder-iron electrodes, without making the joint so wide that the volume of metal needed would be doubled and the welding speed intolerably slow.

Another application of the semiautomatic gun moves cylindrical work mechanically by rotation. The gun is held in the operator's hand. This gives some of the advantages of automatic welding without the investment usually encountered. In fully automatic welding, the new carbon-dioxide shielded process is in competition with a more well-established process—submerged arc—for welding of mild steel. In submerged arc welding, a layer of solid flux is put on the work and welding takes place under this blanket. The electrode is fed into the flux, producing an invisible arc.

The fact that gas-shielded welding does not use a flux is a great advantage and, since the arc is visible, it permits continuous control of the welding at all times. Also, when a solid flux is used, it must be cleaned from the work and the fused flux sep-

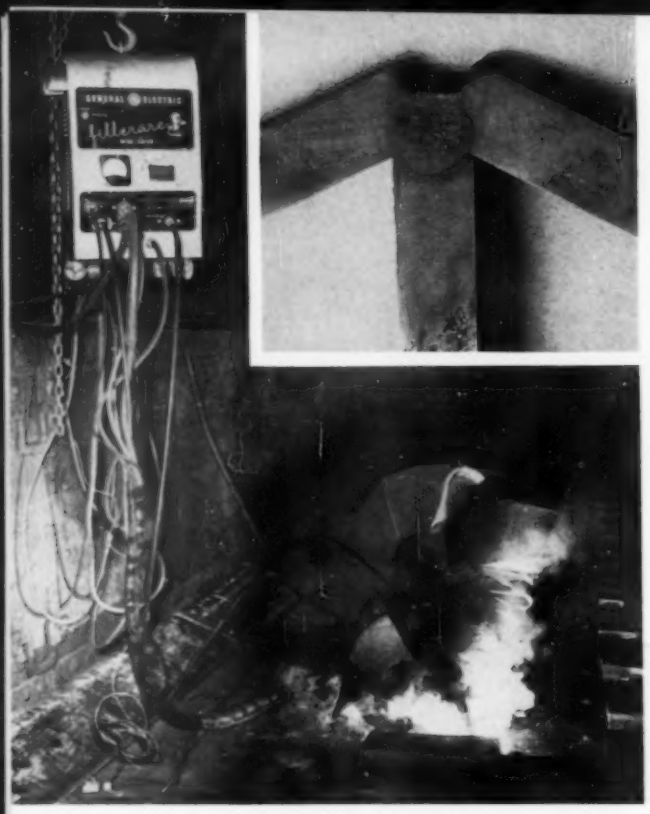


Fig. 2. Manual CO_2 welding of joint illustrated in inset. Welding in narrow space conserves electrodes and produces weld in 5 percent of time for conventional welding.

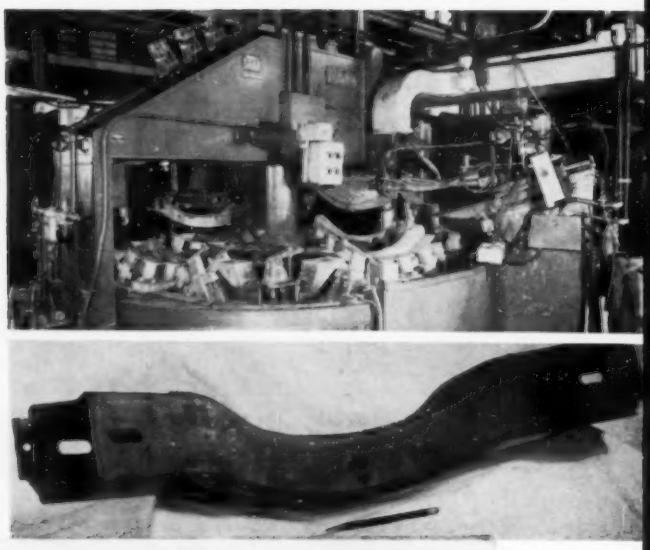


Fig. 3. Automatic CO_2 welding of frame member shown in inset.

arated from the unfused flux. The flux-handling equipment on the welding fixture increases the cost of this machine. Flux removal is never 100 percent efficient and, as a result, abrasive material often gets into bearings and other adjacent parts and damages them. Because the gas-shielded welding process uses no flux, the molten metal freezes more quickly, permitting faster travel on parts which are to be rotated. The molten metal freezes before gravity can pull it off or distort the puddle. This means faster travel speeds are possible with CO_2 welding. On one typical cylindrical part, made on a production basis, bare wire was used originally with a welding time of 28 seconds. Submerged arc did the same job in 14 seconds but CO_2 welding accomplishes it in 9 seconds.

In gas-shielded welding, there is no flux to become entrapped in the groove. Narrower groove welds are therefore possible in multipass work. This means less deposit of weld metal and faster overall travel. Multipass circular parts can be made by running round and round until the groove is filled. Higher duty cycles are possible for this reason and other position work is more easily done. Arc starting is easier with CO_2 welding without need to resort to high-frequency arc starters and the attendant radio interference problems. Two automatic applications of CO_2, where submerged arc was used before, are illustrated in *Fig.* 3 and 4.

In *Fig.* 3 is shown an automatic fixture used to make the frame member shown in the inset. The weld is made with CO_2 gas and a $\frac{3}{32}$-inch steel electrode at a speed of 280 inches per minute. Four welds are made simultaneously, each 17 inches long, in $3\frac{1}{2}$ seconds. *Fig.* 4 shows a machine also used in automatic work which welds two spring cups in three seconds with CO_2 gas. The welders used are 800-ampere transformer-rectifier, constant arc-length type with line-voltage regulation.

Compared to submerged-arc welding, there is more spatter when using carbon-dioxide shielding. However, spatter is usually less than with manual stick-electrode welding. Submerged arc usually has no spatter and the appearance of welds from submerged arc are usually better than with CO_2. However, appearance alone is rarely a deciding factor and should never be used as a criterion of weld quality since welds may look good and yet be porous. Moisture has a deleterious effect on both submerged-arc and carbon-dioxide welding.

The need for adequate ventilation with either welding process is about the same. Since no visible arc is encountered in submerged arc, no light shielding is necessary. Some method of shielding the operator from the ultraviolet rays of the arc, when using carbon-dioxide shielding, is necessary. This problem is about the same as that encountered with manual stick electrodes.

Although carbon dioxide has been applied on steel $1\frac{1}{2}$ inches thick or less, there is no funda-

mental reason why it cannot be used on heavier sections. As far as pounds per hour deposition rate is concerned, carbon dioxide seems to have a higher potential than submerged arc. Although submerged-arc deposition rate limits are more readily known, a great gap exists between theoretical deposition rate and that normally encountered for reasons of joint fit-up, position of welding and fixture limitations.

The investment in automatic welding equipment, for either submerged arc or gas shielding, is about the same. An infinite number of cost comparisons between the two processes are possible. The comparison in TABLE 1 is intended for use as a guide in an analysis of welding costs. No overhead has been applied to labor since this item is subjected to a great deal of variation.

For all practical purposes, the cost of consumables for the two processes are approximately the same. On this basis, the choice must be influenced by other factors such as arc visibility, fixture costs, light radiation, invonvenience of handling flux and other factors including overhead.

One of the factors, however, influencing the choice between these two processes, is determined by joint preparation. Under some conditions, a groove area, only 70 percent of the area needed for submerged-arc welding, is possible. In such applications, savings are possible with carbon-dioxide welding. The wire, the gas and direct labor all can be multiplied by 0.7. As a result, almost a 30 percent savings in overall material and direct labor costs are possible.

In *Fig.* 5 is shown a welding job formerly done by submerged arc in 4 or 5 passes, stopping with each pass to clean out the flux. Now, with a narrower groove, the weld can be accomplished in one-third the time without stopping.

The foregoing deals with fully automatic welding. The following is a comparison of manual welding, based on a ¼-inch horizontal fillet weld.

It is necessary to know the length and size of weld required on the application to be evaluated. These measurements can then be converted to pounds per foot of weld from data obtainable in the *Welding Handbook*. Although this information deals with theoretically perfectly shaped welds, adjustments may be made to compensate for poor fit-up and irregularly shaped welds.

Deposition efficiency is the ratio of the weight of usable metal deposited in the joint compared to the total weight of electrode used. For stick

Table 1—Automatic CO_2 and Submerged-Arc Welding Comparisons for a Typical Job
(based on wire feeding rate of 12 lb/hr for both processes)

Submerged Arc Welding Conditions		
Flux cost	11¢/lb	
Rate of usage of flux	1.5 lb/lb or wire used	
Cost of wire	12¢/lb	
Deposition efficiency	100% (no spatter)	
Duty cycle	60% (no flux handling)	
Labor cost	$2.50/hr	
Co_2 Welding Conditions		
Wire cost	25¢/lb	
Carbon-dioxide gas cost	1.2¢/cu ft	
Rate of usage of gas	30 cu ft/hr	
Deposition efficiency	90% (10% spatter)	
Duty cycle	80% (flux handling)	
Labor cost	$2.50/hr	
Submerged-Arc Welding Cost		
Flux cost	1.5 × 0.11 × 12 = $1.98	
Wire cost	12 × 0.12 = 1.44	
Total for material		$3.42
Labor cost	2.50 ÷ 0.6 =	4.18
Total cost		$7.60
CO_2 Welding Cost		
Wire cost	0.25 × 12 ÷ 0.9 = $3.32	
Gas cost	1.2 × 30 ÷ 0.9 = .40	
		$3.72
Labor cost	2.50 × 0.9 ÷ 0.8 =	2.80
Total cost		$6.52

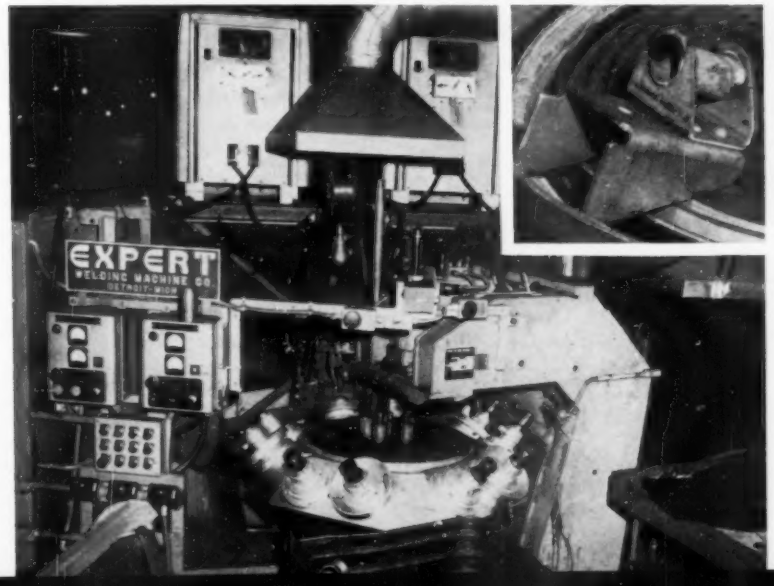


Fig. 4. Spring shackles being CO_2 welded in automatic machine. Shackle is shown in inset in the upper right.

electrodes, the losses would include the stub end losses, spatter losses and the total electrode coating weight. In the submerged-arc process, the deposition efficiency of the electrode approaches 100 percent. In CO_2 gas-shielded welding, some spatter loss may occur. In this comparison, an 8 percent loss (92 percent deposition efficiency) is utilized. Under some conditions, the deposition efficiency of the gas-shielded process may also approach 100 percent.

Overhead rate is shown in the sample calculation on an hourly basis. In some plants the overhead may be a multiplier factor applied to direct labor or materials. In any event, the overhead calculation should be kept as a separate calculation since this factor frequently distorts many process-cost calculations.

Duty cycle is a percentage comparing the actual arc time with respect to total hours worked. It is usually low in any eight-hour period and is greatly affected by the amount of the time required for changing electrodes, chipping slag, sifting flux, vacuum cleaning flux, setting up equipment, etc. On submerged- gas welding, if one man is running the welding head and another is operating the flux recovery system, then the duty cycle will be high, but the use of the two-man team should be reported under other considerations. Since only one man will be required to operate the gas-shielded process on the same application, this should be noted also.

For cost of electrical power consumed, one can usually assume a 50 percent electrical efficiency factor for most welding apparatus. Since the power cost in any welding operation is usually small, this calculation can be eliminated without any significant loss in cost calculation accuracy.

The cost for manual welding the ¼-inch fillet are compared in TABLE 2 for conventional electrode, powder-metal electrode, submerged arc and CO_2 shielded welding. As can be seen, there is a tremendous savings possible by using either the submerged arc or the gas-shielded welding over either conventional or powder-metal electrodes. Use of the manual submerged-arc method is very difficult on the majority of jobs because of the problem of visibility. The process does not permit the operator to see where he is going or where he has been. This is an almost unsurmountable obstacle for practical application in many jobs. With this in mind, it appears that the manual CO_2 process with its full visibility offers the highest savings.

In summary, it can be said that the potential of gas-shielded welding process is greater than any other known welding process. The application of carbon-dioxide gas to carbon-steel welding opens up a tremendous field. The freedom from flux and the use of high travel speeds contribute to potential savings. Equipment—both manual and automatic —is sturdily built and proved in actual production runs. All that remains is to recognize the advantages of this new welding method and apply them to welding problems.

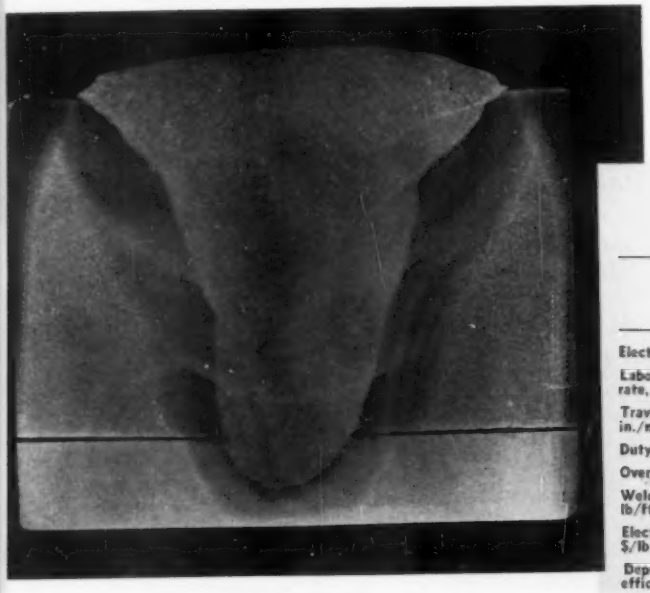


Fig. 5. Cross section view of multi-pass group weld with no cleaning between the ten passes made.

Table 2—Manual Welding Costs
(based on ¼-inch horizontal fillet)

	Conventional Electrode	Powder-Metal Electrode	Manual Submerged-Arc	Manual CO_2 Gas-Shielded
Electrode diam, in.	3/16	5/32	5/64	3/64
Labor rate, $/hr	2.50	2.50	2.50	2.50
Travel speed, in./min	10	15	30	30
Duty cycle, %	30	35	45	60
Overhead, $/hr	5.00	5.00	5.00	5.00
Weld deposit lb/ft of weld	0.106	0.106	0.106	0.106
Electrode cost, $/lb	0.14	0.185	0.135	0.26
Deposition efficiency, %	68	70	100	92
Flux usage ratio lb/lb of electrode	—	—	1.5	—
Flux cost, $/lb	—	—	0.095	—
Gas flow, cu ft/hr	—	—	—	30
Gas cost, $/cu ft	—	—	—	0.01
Welding current, Amp	175	200	350	350
Volts	30	30	35	32
Power cost, $/kwh	0.02	0.02	0.02	0.02
Power source Efficiency, %	50	50	50	50
Weld cost, $/ft	0.528	0.317	0.144	0.119

HYDRAULICS for the Tool Engineer

Part Two—Control Valves, Cylinders and Circuits

By H. L. Stewart*
and
J. M. Moritz

Fluids, pumps, reservoirs, filters, after-coolers and accumulators were discussed in the first article in this series. The current article covers other essential elements of hydraulic power systems. Both articles are written for tool engineers who do not have previous experience in this specialized field.

SUCCESSFUL HYDRAULIC POWER SYSTEMS are the result of careful planning. Each element of the system—power units, control valves, cylinders and others—must be selected on the basis of its contribution to the effectiveness of the system as a whole. Cost and efficiency considerations dictate the need for simplicity of design. Also, the maintenance characteristics of hydraulic components should not be ignored. In the end, low-cost components may be high-cost components if they are subject to leakage, excessive wear or failure in service.

Directional Control Valves

Maintenance characteristics of the control valves that direct hydraulic fluids through a circuit are particularly important. Two-way, three-way, four-way and five-way directional control valves are all in common use. Two-way valves can perform only one operation: starting or stopping the flow of fluid. Placed at a strategic point, a two-way valve can stop all movements of fluid even in the most complex system. Placed in a line that is tied off of the main system line, it can be opened to reduce the operating pressure in the system to zero.

Three-way directional control valves are capable of starting or stopping the flow of fluid and can also direct fluid which has passed beyond the valve back to an exhaust line. Three-way valves are used primarily for actuating single-acting cylinders, in which force is applied in one direction only.

As might be expected, four-way valves have greater versatility than either two-way or three-way valves. They are commonly applied for actuating double-action cylinders and fluid motors. By means of appropriate spool design, a wide variety of characteristics can be obtained. In a typical two-position four-way valve, for instance, *Fig.* 1, there are one inlet port, two cylinder ports and two exhaust ports. When the spool is in the center position, both cylinder ports are blocked. As the spool is moved to the right, oil is fed to the right-hand cylinder port and exhausted from the left-hand exhaust port. The reverse is true when the spool is moved to the left.

Three-position four-way valves give the same action as two-position valves when the spool is in the extreme left-hand or right-hand position. Various other actions are obtainable with the spool in the middle position. All such valves are classified as open-center or closed-center. The cylinder ports of the open-center valve shown in *Fig.* 2a are

*Senior member ASTE South Bend chapter.

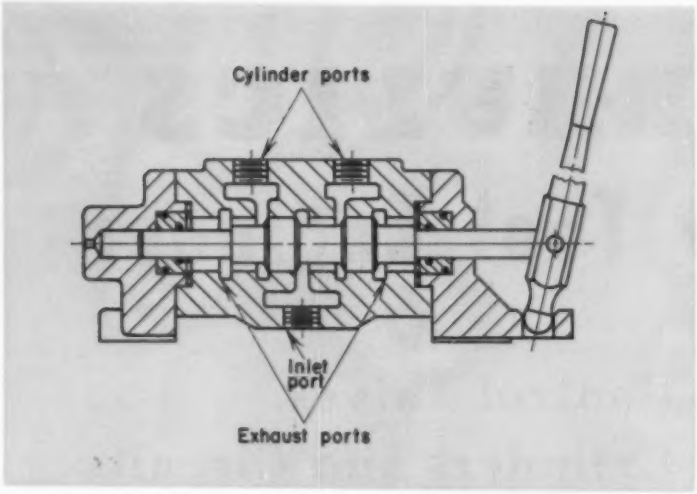


Fig. 1. Two position four-way valve. At one end of the spool travel, the inlet port is connected to the right-hand cylnder port and the left-hand cylinder port is connected to the left-hand exhaust port. At the opposite end of spool travel, these connections are reversed.

blocked when the spool is in the neutral position, and the inlet port is connected to the exhaust port. A valve with a spool of this design can be used to advantage when there are long dwell periods in the system. Such a valve allows fluid to be circulated back to the oil reservoir at low pressure, thus greatly reducing the heat in the system. If a closed-center valve were used for the same application, the heat caused by the full line pressure spilling over the relief valve could damage seals and packing and even cause breakdown of the hydraulic fluid.

In another type of open-center valve, *Fig* 2b, all ports are connected to the exhaust when the valve spool is in the neutral position. The advantage of this type of valve is that all pressure can be immediately relieved from the system when required. In a third type of open-center valve, *Fig.* 2c, when the spool is in the center position, the inlet is open to exhaust, one cylinder port is open to exhaust and the other cylinder port is blocked. It is possible to stop the cylinder movement in one direction and hold it at any desired position. With metering grooves in the spool, inching of a cylinder piston in either direction can be accomplished. Valves of this type are used for lifting mechanisms and similar applications.

Open-center valves can be used to advantage in series, where the exhaust oil from one valve is pumped into the pressure connection of a second valve and so on. Valves in a series circuit cannot be operated simultaneously. Four-way open-center valves will not function when connected in parallel unless some type of exhaust cutoff is used on each valve. Closed-center valves are, therefore, a better choice for applications where valves are connected parallel. There are several types of closed-center valves. In one type, *Fig.* 3a, the inlet is blocked when the spool is in the neutral position, but both cylinder ports are open to the exhaust. This type of valve lends itself to systems in which a mechanical motion is tied in with a hydraulic motion. When the valve spool is centered, there is no fluid pressure on the cylinder that is actuated by the valve. Thus, the cylinder can be actuated mechanically. In another closed-center type valve, *Fig.* 3b, all ports are blocked when the spool is in neutral position.

Controls: Many operators prefer manually actuated direct controls since they allow operation by "feel," which is important with some types of applications. On control valves of large size, however, forty to fifty pounds of force may be required to effect an actuation. In such cases, master valves can be actuated by small pilot valves, actuated in turn by only a few ounces of manual pressure. Valves can also be actuated electrically, by solenoids.

On complicated circuits, pilot-operated valves have several advantages. The pilot-operated valve may be placed adjacent to the cylinder, thus eliminating long runs of large-diameter piping. Easily installed small-diameter piping can be run from the pilot valve to the pilot-operated valve. The pilot valves can be grouped neatly on one panel.

Electrically operated valves are of two types: those with direct-acting solenoids and those with a solenoid-actuated pilot valve. The latter type of valve takes up less than half the space required for a valve with a direct-acting solenoid and requires considerably less current. At low frequency of operation, direct-acting solenoids perform satisfactorily but at high frequency of operation failure is often experienced, particularly if the solenoids are of large size. This difficulty is attributed to the high impact created at the end of the solenoid stroke. Rivets, pins and wearplates frequently cause trouble and large solenoids occasionally burn out.

The service life of pilot-operated solenoid valves is relatively long, because the solenoids have short strokes and lighter-weight plungers, reducing the impact at the end of the solenoid stroke. Most

alternating-current solenoids are rated for continuous duty and small pilot-operated solenoid valves are often operated at more than 60 cycles per minute for extended periods.

Controlling Leakage: Leakage, both internal and external, is one of the major problems associated with directional control valves. External leakage is unsightly, may cause the floor adjacent to a machine to become slippery and presents a fire hazard where petrolum-base fluids are used. During the past decade, improvements in shaft seals, gaskets and pipe connections have helped to reduce external leakage problems. Recommendations of equipment and fluid manufacturers should be followed when specifying these items.

Excessive internal leakage reduces the efficiency of the system and may cause malfunctions or allow the actuated mechanism to drift. Internal leakage has several possible causes. As oil temperatures increase, oil viscosity is reduced, contributing to leakage. In spool type valves, the fit between the valve body and spool is close when the valve is new, but as the valve wears the clearance grows and leakage increases. Dirt in the system will contribute to leakage by cutting grooves in valve bodies and spools. Some development work has been done to reduce internal leakage by using seals on the valve spools. This may provide a solution.

Subplate-mounted valves are an important means of combating leakage. In these valves, all pipe connections are contained within the subplate. The passages from the subplate to the control valve are surrounded by O-rings or "quad" rings used as static seals. There is little chance of external leakage, since most such valves are pilot-operated and there are no valve stems protruding through the cover. One of the main features of subplate-mounted valves is that the valve can be readily replaced without disturbing the piping. In high-production machines, or in machines where there are a number of valves mounted close together, this is an important advantage.

Cylinders

One of the most important advantages of hydraulic power is its flexibility. Hydraulic cylinders, for instance, can be actuated at near-zero pressure or at the maximum pressure for which they are designed. A cylinder can operate at slow motion under high pressure or at high speed under low pressure. Most cylinder failures can be traced to the selection of a cylinder that did not fit the requirements of the job. Careful study of operating conditions will pay off in terms of longer service life.

Selection: The first question to be answered when selecting a cylinder for a specific application is at what operating pressure will it be used? Operating pressures are dependent on service requirements, space limitations, relative costs and, for some applications, weight limitations.

Space limitations often make it necessary to operate at higher pressures. A cylinder with a 3.25-inch bore, operating at 1750 psi, for example, can produce the same amount of force as a cylinder with an 8-inch bore operating at 350 psi. The mounting width of the smaller cylinder is 4½

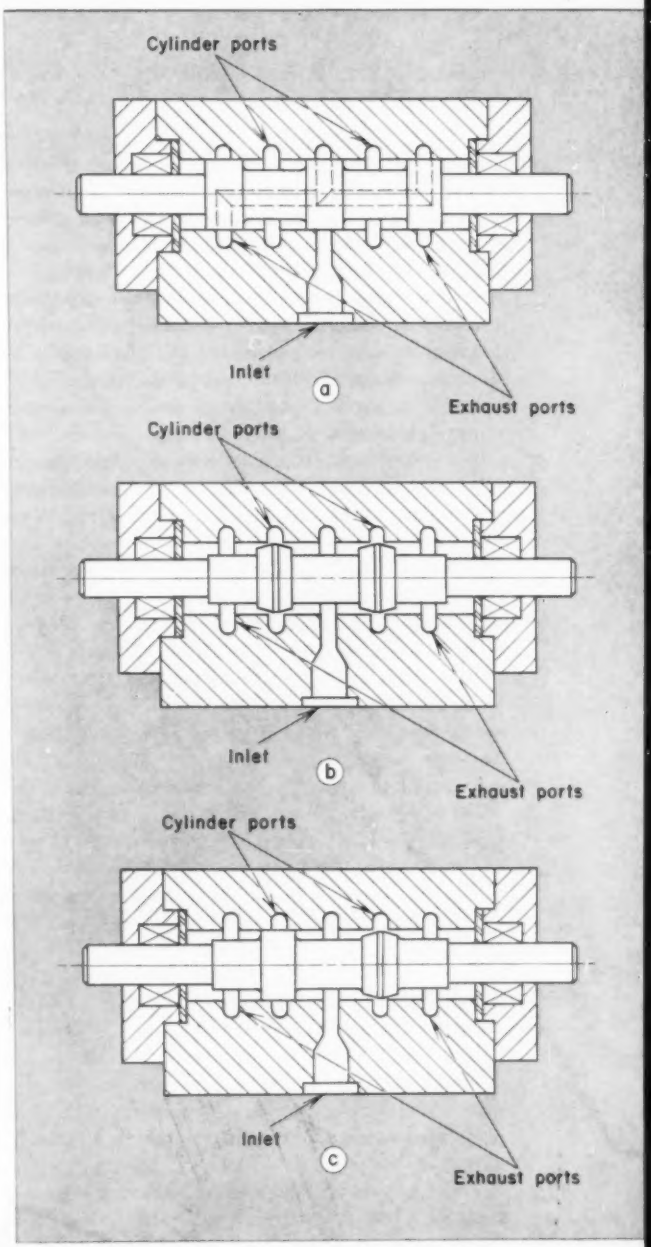


Fig. 2. Three-position open-center four-way valves offer versatility.

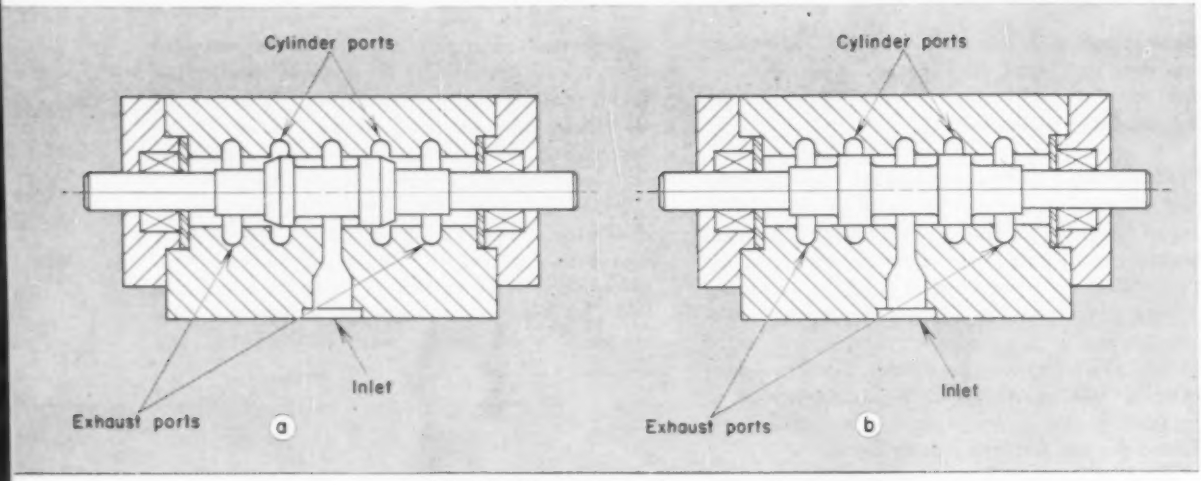


Fig. 3. Three-position closed-center four-way valves.

inches; the mounting width of the larger cylinder is 8½ inches. Cylinders that operate at high pressures cost more and to this cost is added the greater cost of other components in the system, which also must operate at high pressures.

If a cylinder is to be subjected to continuous cycling, all wearing parts—seals, packings and bearings—must, of course, be designed for continuous operation. It is not uncommon for a cylinder to cycle 15,000 times during the course of an eight-hour shift.

For other applications, where cylinders remain idle for long periods of time, there are different requirements. On this type of application, there may be a reaction between the oil, the packing and the metal during long idle periods. The rod packing may tend to seize the piston rod, pitting the rod and tearing the packings when the rod is moved. Metallic seals help to eliminate this difficulty.

If a cylinder will be subjected to high shock loads in service, use of a cylinder with an all-steel, rather than cast iron, cover should be considered. Cast-iron covers sometimes split under high shock loads, or a section may break around a mounting.

Oil temperatures can usually be controlled, but it is often difficult or impossible to control atmospheric temperatures in the vicinity of the cylinder. When the internal or external temperature of a cylinder exceeds 150 F, high-temperature seals are advisable. Excessive heat causes packings and seals to age and deteriorate. It may be necessary to install heat shields to protect a cylinder against blasts of hot air in foundry and similar applications where ambient temperatures are high.

Where there are wide temperature fluctuations, expansion and contraction of cylinders is often a problem. Pistons constructed with nonmetallic seals eliminate this difficulty.

There are many applications where the piston must be stopped somewhere in its travel and held at that position for a definite time. Any internal leakage will cause the piston to drift. Use of a cylinder with an 0-ring, "quad" ring or synthetic packing on the piston is recommended.

External leakage at joints between covers and cylinder tube can be prevented by using 0-ring seals. Leakage around a piston rod can be overcome with adequate gasketing.

Cylinders used on applications where down time would have serious consequences should be of the highest quality obtainable. As a further precaution, they should be easily replaceable in the event of failure. Manifold mounting, in which a cylinder requires no piping connections, is an important means of reducing down time. A typical manifold plate, *Fig.* 4, is held by only four screws.

When a cylinder must be used in locations where there is a considerable amount of dirt or foreign particles, rod wipers help to prevent damage. In severe cases, rod boots, *Fig.* 5, made of synthetic rubber, impregnated canvas, or leather, are advisable to eliminate possible trouble.

Speed of operation is another factor in cylinder selection. If a cylinder is to be subjected to high speeds, the designer should choose a cylinder that has pipe ports large enough to receive and exhaust the oil. For the majority of applications, cylinders should be cushioned in order to relieve shock at the end of the piston stroke. Most standard cushions are approximately one inch long. These are adequate for normal service, but where heavy loads are moved at high rates of speed, cushions up to eight inches long may be required to give adequate deceleration. In one successful cushion design, *Fig.* 6, the cross section of the orifice is gradually diminished, fading to zero shortly before the piston contacts the cover. A graduated orifice in the cylinder cover meters the balance of the trapped oil. Cam-operated cushion valves also give good results. The length of cushioning can be adjusted by chang-

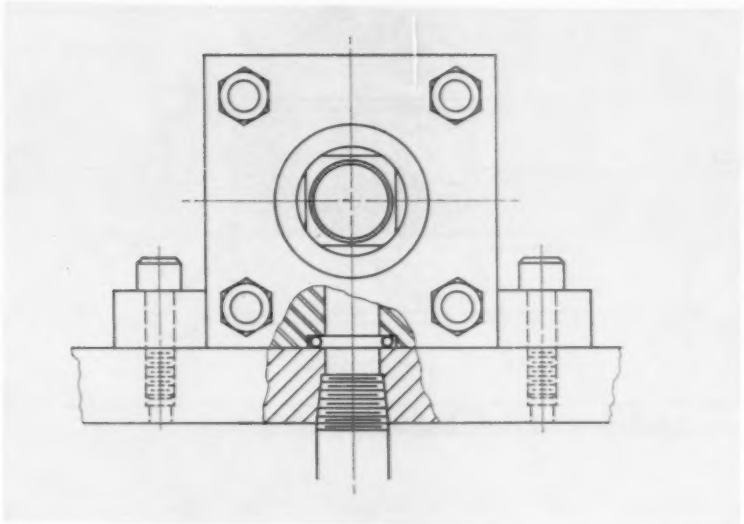


Fig. 4. Manifold-plate mounting makes it possible to quickly remove and replace cylinders.

ing the setting of the cam. Such devices, however, take up considerable space and therefore may not be practical for all installations.

Mounting: No cylinder can give optimum service unless it is adequately mounted. On long-stroke cylinders, the end of the piston rod should be supported and the supports should be designed to permit easy alignment. Cylinders designed so that the piston rods extend from both covers are desirable for long-stroke applications, since they provide three-point support for pistons and rods. Large-diameter piston rods have less tendency to sag than smaller-diameter rods.

If possible, cylinders should be mounted so that not all of the stress is placed on the mounting screws. This reduces the strain on the screws and eliminates a possible cause of trouble in service.

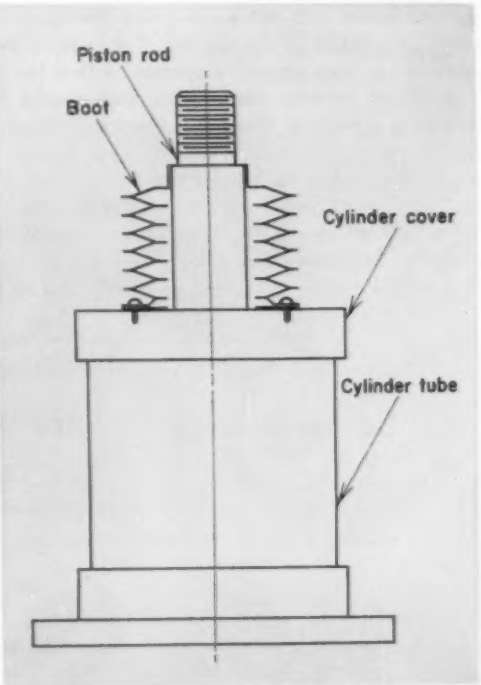
Rotating Cylinders: Rotating hydraulic cylinders provide a source of power for clamping devices used on machines with rotating spindles. They are similar in design to reciprocating cylinders except that they have a distributor to effect rotary motion of the shaft. Most of the rules which apply to the selection and mounting of reciprocating cylinders also apply to the selection of rotating cylinders. When such cylinders operate at high speeds, it may be necessary to provide a water jacket around the distributor to prevent the packings from overheating. This will minimize packing troubles.

Rotating cylinders are built in sizes ranging from 3 to 20-inch bores. Operating pressures are as high as 1500 psi in some models.

Fig. 5. Rod boot covers piston rod, keeping it clean in service. Boot expands and contracts like a camera bellows, covering critical area.

Hydraulic Motors

Hydraulic motors may be of several designs, such as radial-piston, axial-piston, gear types and vane types. Like pumps, they are available in constant-displacement and variable-displacement designs. Unlike most electric motors, hydraulic motors can be stalled without damage. They are more compact than electric motors and can be stopped or reversed by merely shifting a control valve. Motors on the market today can be operated at pressures up to



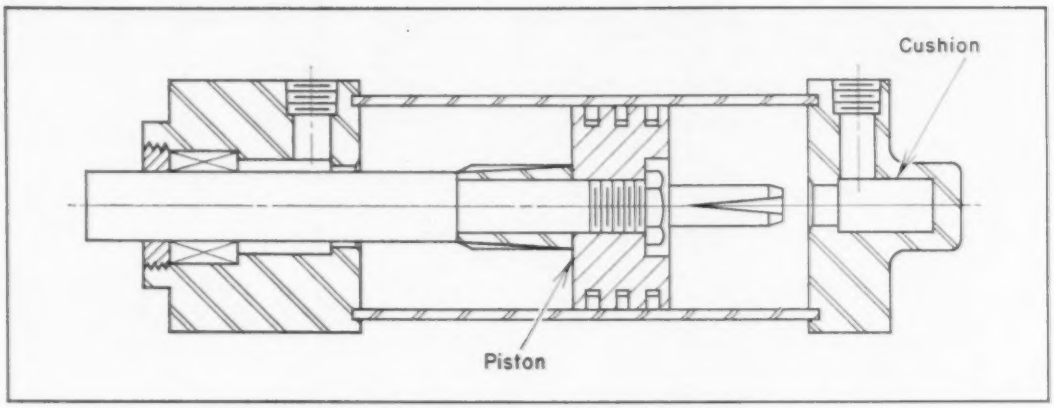


Fig. 6. Cylinder designed to provide cushioning effect at end of stroke.

5000 psi and at speeds up to 3000 rpm. Some motors have outputs of over 160 hp and can provide torque as high as 5000 lb-in.

Circuits

Circuit design is a specialized field; however, there are several factors that should be kept in mind when specifying hydraulic circuits. Obviously, a circuit should be capable of performing the operations for which it is designed. Protection of the operator is of equal importance.

Use of dual control buttons should always be considered when there is a possibility of danger to an operator. It is relatively simple to design a circuit in such a way that a press ram or similar moving component will not move unless the operator keeps both hands on the controls. The controls can be placed so they cannot be operated with a bar or stick placed between them. Also, they should be located in a position where it is impossible for any part of an operator's body to get in the way of a moving part when he has both hands on the controls. "Built-in" safety greatly reduces hazards.

For operations where there is an element of danger to the operator, such as flying glass, ejection of chemical sprays, hot metal or chips, the circuit can be designed with interlocks that prevent the circuit from functioning until all safety guards are in place. Similarly, interlocks can be provided to prevent movement of machine members if a workpiece is incorrectly positioned.

By incorporating a pressure relief valve in the circuit for a hydraulically operated machine, the cylinder can be made to stall if excessive forces are encountered. This can eliminate possible damage to a workpiece or to the machine itself in the event of jamming or similar malfunctions.

For any given application, there are a number of possible circuits, each of which would give satisfactory results. In general, the simplest circuit is preferred. It will ordinarily be the lowest-cost circuit since fewer components will be required. Operating and maintenance costs will also be lower because there are fewer components to replace in the event of component failure. Trouble-shooting will be easier for the same reason.

Operating and service conditions, initial and long-term costs, and functional requirements must all be taken into consideration in designing hydraulic power systems. Time spent in evaluating these factors is well spent, since it results in higher efficiency and, in the long run, lower costs.

Small Business Survival – Through Automation

INCREASED PRODUCTIVITY and minimized waste through automatic controls and similar cost cutting tools can help offset higher costs in small businesses according to Henry F. Dever, vice-president of Minneapolis-Honeywell Regulator Co. Lives of small businesses are particularly threatened by the squeeze on profits of rising labor and material costs and effects of large scale competition, and it is only through improved productivity that they can survive. Mr. Dever predicts that the economy of instrumentation, which provides automatic control, and other forms of automation such as data handling systems for measuring variables etc., can spark the increased productivity necessary.

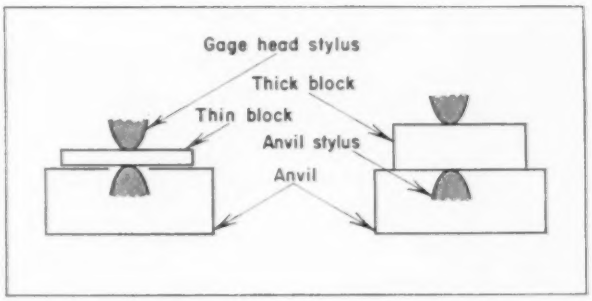
designed for

PRODUCTION

Gage-Block Checker Saves Time

Design of this gage-block checking instrument permits readings with repeat accuracy within one-millionth inch. Inspection time is saved because it is unnecessary to reset the device between gage blocks of different sizes. Readings can be taken without clamping the block. Gaging pressure is 8 oz.

Tests have shown that the gaging head can be quickly set to the master within several millionths of an inch by movement of an arm actuating a precision ratchet. Final setting can be made to a small fraction of a millionth on a reset device in the base. Operator's hands never touch the gaging head in this unit developed by The Sheffield Corp.

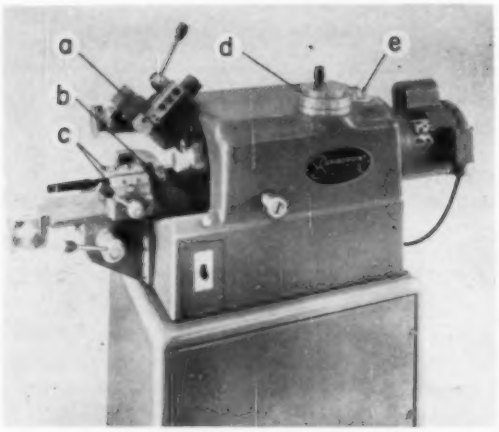


GAGE POINTS contact the gage block for direct point-to-point measurement. Light, thin blocks are carried above the anvil but heavier blocks depress the anvil stylus so block weight is carried by the anvil.



TWO OPPOSING electronic gaging cartridges act as a caliper on two sides of gage blocks being checked. This equipment provides magnifications up to 100,000:1, for which one-millionth of an inch is indicated by graduations 0.1 inch apart. The cooling-out table at the front of the unit permits gage blocks to stabilize at room temperature at the same height as the anvil prior to checking.

Machine Generates Spiral Points on Drills

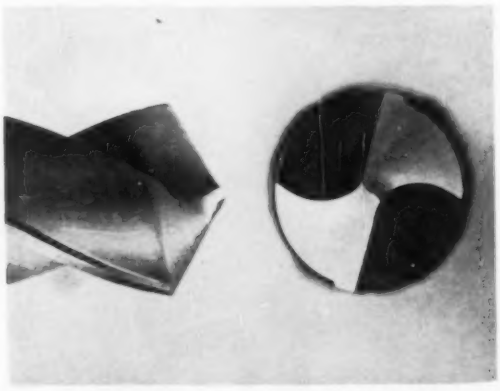


DRILL GRINDER developed for forming spiral points on twist drills. The drill is held stationary while the generating system gyrates around it. Small tubular grinding wheel *a* is mounted in a rotatable carrier. An adjustable truing device is provided so the wheel can be dressed for point angles between 90 and 180 deg. The drill is oriented against retractable bushing *b*, clamped in jaws *c* and advanced toward the grinding wheel. Correct combination of radial and axial motions for the wheel for any size drill is set by dial *d*. Values of relief other than standard are set by adjusting dial *e*.

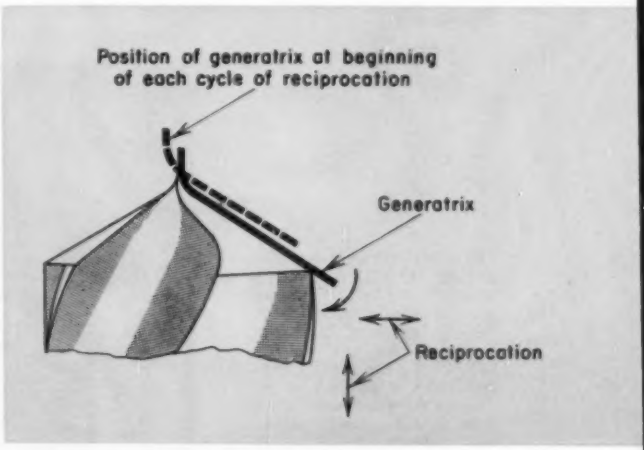
Practical use of spiral-pointed drills could only be achieved if a simple grinder were available to form the correct shape. Such a machine has been developed by the Cincinnati Lathe and Tool Co., who also developed the unusual drill shape.

Spiral-pointed drills produce round, straight, true holes at proper locations without spotting or center punching because the center can cut. There is no tendency toward "walking." Required drill thrust forces are reduced and drill life is extended with this design. The self-centering effect of this spiral point means that holes can be drilled without complicated jigs and fixtures.

Spiral-pointed drills are not limited to one particular point angle or clearance. Both of the dimensions can be easily changed, by adjusting the grinding machine motions, to give better performance for a particular material or workpiece thickness. By changing the point angle from 118 to 180 deg, for example, sheet metal can be drilled without grabbing and without leaving a burr.



SPIRAL-POINT DRILL configuration has the entire flank surface associated with each cutting edge formed as a three-dimensional spiral surface extending from the drill axis to the periphery. The chisel edge normal with twist drills is replaced by a characteristic S-shaped cutting edge, the two halves of which are formed by two arcs intersecting in a point at the drill axis. Since there is an actual point rather than a chisel edge, drill has no tendency to wander.



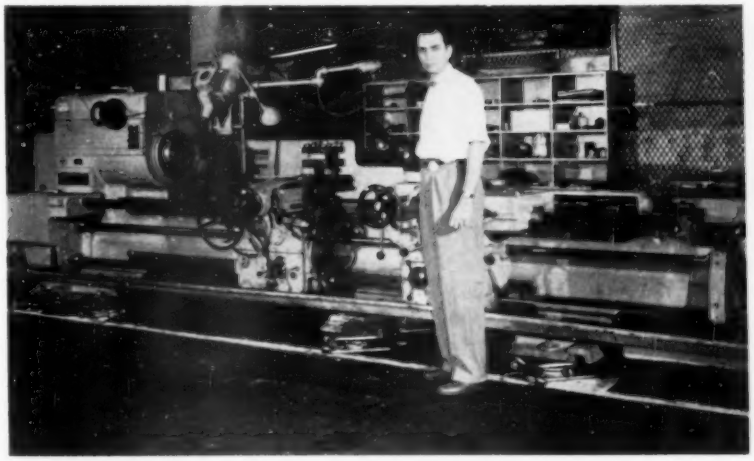
GENERATION of the spiral point is shown in a simplified sketch. A straight-line generatrix, terminating in a small radius, is rotated about the axis of the drill while being simultaneously reciprocated through small distances, both radially and axially, twice per revolution. These motions are positively controlled by camming. In practice, the generatrix is the conical surface of a small grinding wheel whose axis is parallel with the drill axis.

VIBRATION MOUNT

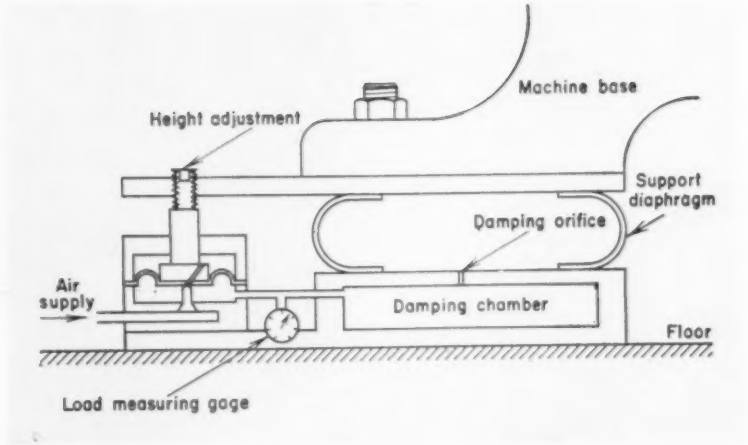
Loads Machine Supports Fairly

Mounting machines so they are isolated from vibrations and so they are truly level has always been a problem. This solution to the problem is basically simple and highly successful. An air-cushion mount is placed under each machine support and balanced out by a built-in gage to carry its fair share of the load. These gages make it possible to keep the machine properly leveled.

Specially prepared machine foundations are unnecessary because these mounting units, developed by Weber Instrument Co., can be installed on any type of flooring. In addition to isolating vibration, these units permit matching the manufacturers recommendations for leveling so the machine will maintain its accuracy and not be subject to abnormal wear. Replacement of machines for shop relayout is easy because no special floor preparation is necessary and releveling is not a problem.

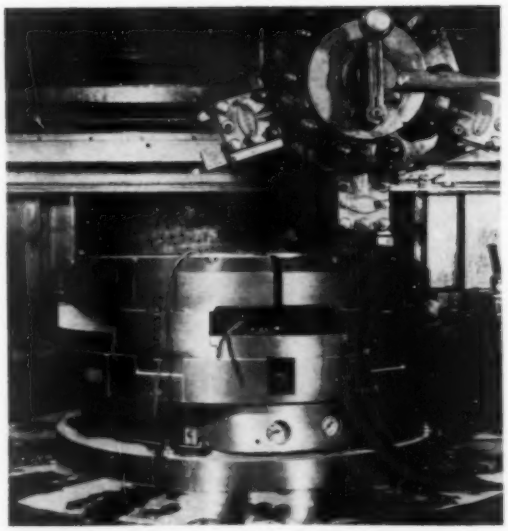


LARGE MACHINES must be mounted in such a way that each support assumes its fair share of the gross weight under all dynamic and static load conditions. This lathe is mounted on pneumatic units that allow weight to be correctly distributed.



PNEUMATIC MOUNTS carry machine weight on cushion of air. By adjusting height and checking load measuring gages, machines can be leveled precisely. Because all units are supplied by same air system, fluctuations in air pressure will not distort machine.

Chucks Hold Rings Without Distortion

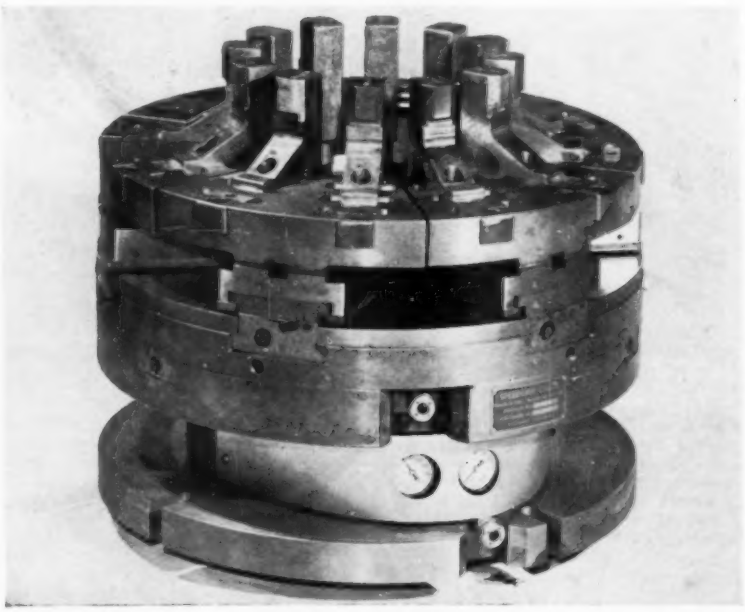


SELF-CENTERING chuck used on vertical turret lathe for the production of thin-walled jet-engine parts. Wrap-around jaws hold workpiece securely without distortion. With this chuck, holding forces up to 100,000 lb can be realized with 100-psi shop air.

Quick-acting chucking mechanisms capable of holding thin-walled circular parts without squeezing them out of round have been difficult to design for vertical turret lathes because they could not be powered by air cylinders. The design of these chucks is such that connection to an air source is not necessary during the machining cycle.

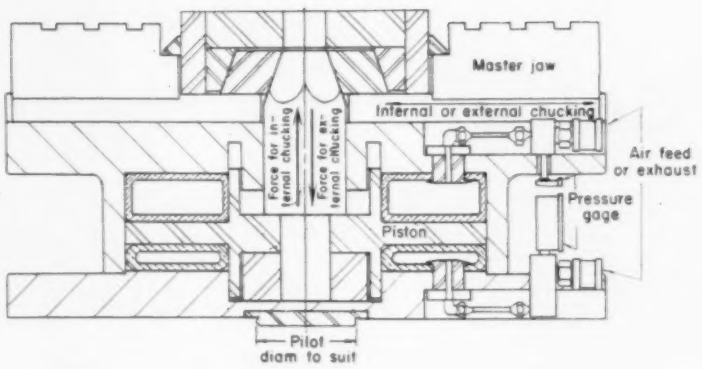
Two styles of chucks have been designed by the Speedgrip Chuck Div., Ernest, Holdeman & Collet, Inc., around the basic idea. One type is used for first operations and can compensate for workpiece irregularities. The other type is self-centering and is used on secondary operations. Both types have chip rings that prevent chips from obstructing movement of the jaws.

With chucks that do not distort the workpiece, it is frequently possible to reduce the amount of stock to be removed during machining, and savings can be achieved. On one lot of 500 titanium rings, the parts were contour-rolled close enough to finished size that a saving of $100,000 was effected on material alone. The saving was attributed to the non-distorting chucks used during machining.

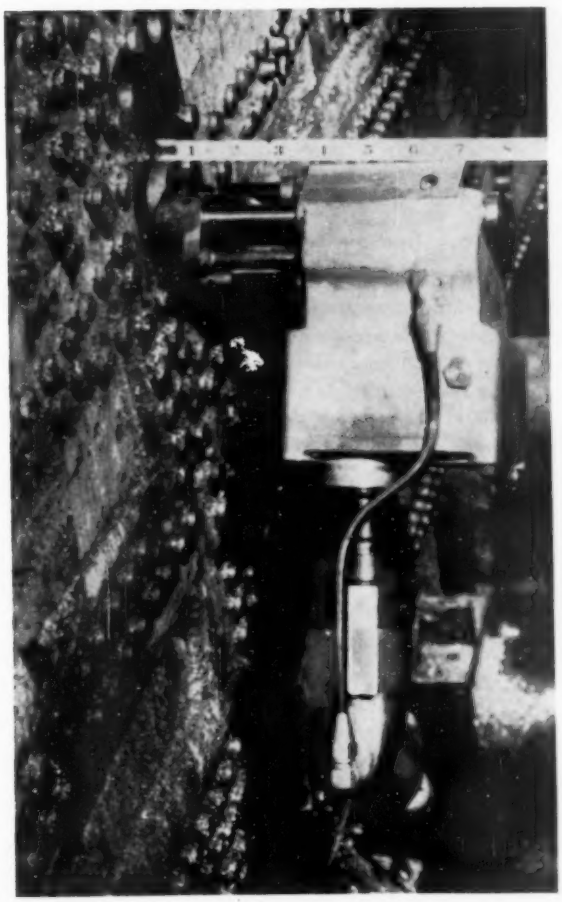


HEART of this chuck is two rubber tubes that can be inflated or discharged quickly. Lines of force and surfaces against which pressure is exerted can be seen easily. When the upper rubber tube is inflated, the piston is forced downward and the jaws move toward the center for external chucking. Inflation of the lower tube, reverses the action and chucking is done internally. Tubes can hold air pressure for several weeks so no connection to air source is needed during work cycle.

COMPENSATING CHUCK with a set of intermediate jaws and 12 hardened inserts for use in internal chucking. Extra slots in the intermediate jaws can accommodate a wide variety of inserts. An air gage is provided for each tube so that inflation can be regulated by incoming air pressure or by actual tube pressure. An air gun is attached to the air valves, above and below gages, for inflation or discharge.



Portable Drill Feeds Automatically



This mechanically fed air drill is solving difficult drilling problems because it can be taken to the work. The drilling or reaming cycle is automatic on this portable tool and a single operator can handle several units.

Production costs are reduced by the automatic drilling cycle because both operation time and air consumption are under control.

Dimensions of this drill, developed by Hanover Tool Co., are such that it can be used in cramped quarters and close to projections from the surface to be drilled. The feed can be adjusted for any drill movement up to two inches.

PORTABLE DRILL in drilling position. Nose of unit has been inserted in fixture bushing and twisted to engage lock screws. After starter is actuated, drill will automatically feed to predetermined depth and return rapidly. Short overhang minimizes leverage on fixture bushing.

Calculating Economic CUTTING SPEEDS

By Frank J. Gallagher*
Engineering Planner and Estimator
Aerojet-General Corp.
Azusa, Calif.

There is an optimum economic cutting speed for every metal-cutting operation. This speed is the speed at which lowest cost production is obtained. It can be easily calculated, using a simple formula developed by the author.

THERE IS A DEFINITE RELATIONSHIP between cutting speeds and tool life. As cutting speeds are increased, there is a corresponding decrease in tool life. Tools must be changed frequently, with consequent machine down time, so there may be no over-all improvement in machine efficiency. With low cutting speeds, on the other hand, down time for tool changes is at a minimum, but cutting efficiency is also at a minimum.

From the standpoint of cost, there is always an optimum cutting speed. This is not the highest speed obtainable under given cutting conditions, or the speed that gives longest tool life, but the speed that results in lowest cost per piece.

Most methods for determining optimum cutting speeds for drilling, milling, turning, *Fig.* 1, and similar metal-cutting operations require rather complex mathematical calculations. There is, however, a relatively simple method which can be quickly applied by shop personnel.

Cutting-Speed Formulas

In using the method, only the cutting speed-tool life relationship is considered. All other factors, such as depth of cut, feed, tool and workpiece materials, tool geometry and finish, and coolants are assumed to remain constant.

To find the optimum economic cutting speed for any operation, five values must be determined: initial tool life under cut, per grind, in minutes (T_1); initial cutting speed in fpm (V_1); time in

*Senior member San Gabriel Valley chapter.



—Photo courtesy Metallurgical Products Dept., General Electric Co.

Fig. 1. Machining a forged steel part after heat treatment at Menasco Mfg. Co., Burbank, Calif. Through use of formulas, optimum cutting speed can be established after a short test run.

minutes to remove the tool for grinding and replace it in the machine (R); time in minutes to grind the tool (G); and a quantity Z, which is the initial cost of the tool, per grind, in terms of machine time. This quantity is found by dividing the cost of the cutting tool, dollars, by 1 plus the number of regrinds per tool (N) times machining labor and overhead, dollars per minute (R_m). Where D is the cost of the tool, Z can be expressed:

$$Z = \frac{D}{(1 + N)\ R_m}$$

The value of n, an exponent in the cutting speed-tool life law,* must also be known. Values of n for several cutting tool materials are listed in the accompanying table.

To calculate optimum tool life per tool change, the following formula is used:

$$T_o = \left(\frac{1}{n} - 1\right)(R + G + Z)$$

A factor for correcting tool life (X) is obtained as follows:

$$X = \frac{T_o}{T_i}$$

Once X is known, a factor for correcting initial cutting speed, Y is determined from a nomogram, *Fig.* 2. This factor is used to find the optimum cutting speed,

$$V_o = YV_i$$

An example of the steps in solving an actual problem is shown in the accompanying chart.

*See *The Tool Engineers Handbook*, 1949 edition, page 323.

Derivation of Formulas

The total cost of performing a given cutting operation on an individual part is the sum of three separate costs: handling, machining and tool replacement. Each of these costs can be expressed in term of equivalent machining time. To do so, each cost is divided by the per minute rate of machining labor plus overhead. The total equivalent machining time charged to an individual part is simply the sum of three converted times: handling, machining and tool replacement.

Handling time, H, is the time required for machine loading and unloading, in minutes per part.

Nomenclature

C = machine cutting time per part, minutes

C_1 = a constant depending on machine and work material variables

D = tool replacement cost, dollars

F = linear length of cut per part, feet

G = time to regrind tool, minutes

H = machine handling time per part, minutes

N = number of regrinds per tool

n = exponent in cutting speed—tool life equation

R = time to remove tool for grinding and to replace in machine, minutes

R_m = rate for machining labor plus overhead, dollars per minute

T = cutting time per tool change, i.e., tool life per grind, minutes

T_o = total equivalent machining time per part, minutes, i.e., the ratio of total manufacturing cost per part, dollars, to machining cost per part, dollars per minute

V = cutting speed, fpm

X = tool life correction factor

Y = cutting speed correction factor

Z = quantity, minutes, obtained by dividing tool replacement cost, dollars, by 1 plus the number of regrinds per tool times the machining labor plus overhead rates, dollars

Note: The subscript i indicates an initial value; the subscript o indicates an optimum value. Thus, V_i is initial cutting speed; V_o is optimum cutting speed.

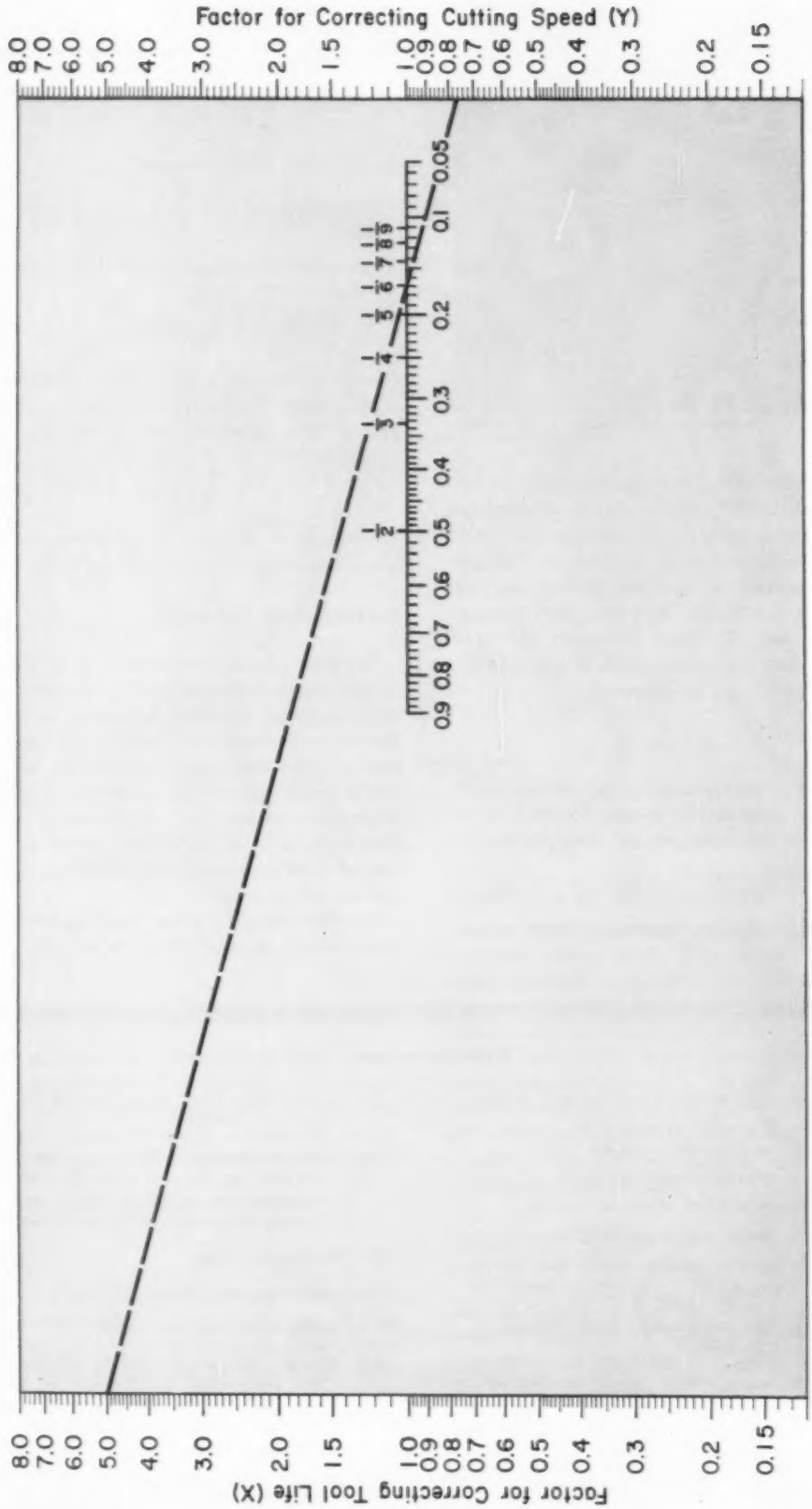


Fig. 2. Nomogram for finding correction factor for cutting speed (Y). In the example (broken line) $X = 5$, $n = 1/6$ and $Y = 0.76$. Initial cutting speed is multiplied by 0.76 to find economic speed. Horizontal scale shows values of n.

Steps in Calculating Economic Cutting Speed

1. *List known factors*

Initial tool life per grind, minutes (T_i)	30
Time to remove and replace tool, minutes (R)	5
Time to regrind tool, minutes (G)*	15
Cost of cutting tool, dollars (D)	10.00
Number of regrinds per tool (N)	4
Machining labor plus overhead rate, dollars per minute (R_m)	0.20
Initial cutting speed, fpm (V_i)	200
Value of $(1/n) - 1$ for cutting tool material (material is high-speed steel, value taken from table)	5

2. *Determine value of quantity Z, minutes*

$Z = D / (1 + N) R_m$

$= 10.00 / (1 + 4)\ 0.20$ — 10

3. *Find optimum tool life, minutes (T_o)*

$T_o = (1 / n) - 1 (R + G + Z)$

$= 5 (5 + 15 + 10)$ — 150

4. *Find factor for correcting tool life (X)*

$X = T_o / T_i$

$= 150 / 30$ — 5

5. *Find factor for correcting initial cutting speed (Y)* (from nomogram) — 0.76

6. *Find optimum economic cutting speed, fpm (V_o)*

$V_o = YV_i$

$= 0.76\ (200)$ — 152

*Note. If the labor plus overhead rate for grinding is different from the labor plus overhead rate for machining, convert grinding time to equivalent machining time by multiplying grinding time by the ratio: grinding labor plus overhead rate divided by the machining labor plus overhead rate. If grinding service is purchased, convert grinding cost into equivalent machining time by dividing the outside grinding cost, per tool, by the machining labor plus overhead rate per minute.

It is independent of cutting speed. Cutting time, C, is the time in minutes per part to finish a part at a given cutting speed, and is directly dependent on cutting speed. The machining time equivalent to the tool replacement cost per part also depends on cutting speed and can be computed as follows:

Let T be the life of the tool, in minutes, per tool change at the given cutting speed. Then C/T is the number of tool changes required per part. The tool replacement cost per tool change is $R + G + Z$, when expressed in terms of machine time, i.e., $(R + G + Z)\ R_m$ is the tool replacement cost per tool change, expressed in dollars. Therefore $(R + G + Z)\ C/T$ is the tool replacement cost per part expressed in equivalent machining time.

The total manufacturing cost per part, expressed in equivalent machining time (T_e) is given by the following equation:

$$T_e = H + C + \frac{(R + G + Z)C}{T} \quad \ldots\ldots\ldots\ldots (1)$$

Equation 1 is the first step in determining the cutting time or the cutting speed which will result in minimum manufacturing cost per part. The T which enters in Equation 1 depends on cutting time or cutting speed as given by the tool life-cutting speed law in the *Tool Engineers Handbook:*

$$VT^n = C_t \quad \ldots\ldots\ldots\ldots (2)$$

where n and C_t are constants that depend upon the tool material, the work material and other machine variables. The relation between V and C is given by:

$$VC = F \quad \ldots\ldots\ldots\ldots (3)$$

where F is linear feet cut per part.* In terms of cutting speeds, Equation 1 may be rewritten:

$$T_e = H + FV^{-1} + (R + G + Z)\frac{F}{(C_t)^{1/n}} V^{(1/n)-1} \quad \ldots\ldots\ldots\ldots (4)$$

Critical values (V_o) of the cutting speed, that is, speeds which would give minimum or maximum machining time per part, can be found with the calculus by setting the first derivative of T_e with respect to V equal to zero.

$$\frac{dT_e}{dV} = -FV^{-2} + \left(\frac{1}{n} - 1\right)\frac{F(R + G + Z)}{(C_t)^{1/n}} V^{(1/n)-2}$$

That is,

$$-FV_o^{-2} + \left(\frac{1}{n} - 1\right)\frac{F(R + G + Z)}{(C_t)^{1/n}} V_o^{(1/n)-2} = 0$$

or,

$$V_o = \frac{C_t}{\left[\left(\frac{1}{n} - 1\right)(R + G + Z)\right]^n} \quad \ldots\ldots\ldots\ldots (5)$$

Note that for V_o to be meaningful, $1/n$ must be larger than one, otherwise V_o would be either negative or infinite. This condition is satisfied by all known values of n.

The corresponding expression for critical tool life per tool change is found from Equation 5 ($V_o = C_t/T_o^n$) by the use of Equation 2 and is simpler:

$$T_o = \left(\frac{1}{n} - 1\right)(R + G + Z) \quad \ldots\ldots\ldots\ldots (6)$$

That V_o is the desired optimum cutting speed (and therefore T_o is the optimum tool life) which gives the minimum value for T_e follows from the

*That is, F times the average cross section of the chip is equivalent to the volume of metal removed per part.

Values of n for Various Materials*

Material	n	$\frac{1}{n} - 1$
High-speed steel	1/6	5
High-speed steel (12 percent cobalt)	1/5	4
Cast alloy	1/3.7	2.7
Carbide	1/2.45	1.45

*Value for high-speed steel taken from the *Tool Engineers Handbook*. Other values taken from *Design and Use of Cutting Tools*, by Lee J. St. Clair, published by McGraw-Hill, 1952.

fact that it is the only critical value found and the fact that increasing cutting speed obviously decreases machining time (C) while it increases tool replacement cost per part. Mathematically, this follows from the fact that the second derivative of T_o with respect to V is positive for $V = V_o$:

$$\left.\frac{d^2T}{dV^2}\right|_{V=V_o} =$$

$$= \frac{2F}{(V_o)^3} + \left(\frac{1}{n} - 1\right)\left(\frac{1}{n} - 2\right)\frac{F(R + G + Z)}{(C_t)^{1/n}}\, V_o^{(1/n)-3}$$

$$= \frac{F}{V_o^3}\left[2 + \left(\frac{1}{n} - 2\right)\frac{\left(\frac{1}{n} - 1\right)(R + G + Z)}{(C_t)^{1/n}\,(V_o)^{-1/n}}\right]$$

$$= \frac{F}{V_o^3}\left[2 + \left(\frac{1}{n} - 2\right)\frac{T_o}{T_o}\right], \text{ by Equations 6 and 2}$$

$$= \frac{F}{V_o^3}\left(\frac{1}{n}\right)$$

Since F, V_o, and n are always positive, d^2t/dV^2 is also always positive for $V = V_o$.

The optimum cutting speed (V_o) can be computed from the optimum tool life per tool change (T_o) by the use of Equation 2 which can be written:

$$VT^n = C = V_tT_t^n$$

where T_t is tool life per tool change at initial cutting speed V_t. Thus,

$$\left(\frac{T_t^n}{T}\right) = \frac{V}{V_t}$$

Letting $X = T/T_t$ be the correction factor for tool life per tool change ($T = XT_t$) and $Y = V/V_t$ be the correction factor for cutting speed ($V = YV_t$), then Equation 2 may be written:

$$YX^n = 1 \qquad (7)$$

The advantage of this form of the cutting speed-tool life law is that a single nomogram can be made for all tool materials. Optimum economic cutting speed can be computed from the nomogram by determining the value of Y corresponding to the value of $X = T_o/T_t$ on the nomogram, and the relation $V_o = YV_t$.

'FLOATING METALS' help to further scientific study



Close-up view of levitation melting. A high frequency alternating current flowing in the coil causes the metal sample to melt at thousands of degrees above white heat. As can be seen in the center of the coil, the molten mass now floats freely in air.

Scientists at Westinghouse Research Laboratories and the University of British Columbia now have a method of obtaining pure laboratory scale ingots of the new wonder metals. Conventional melting methods have been unsatisfactory because the new metals melt at very high temperatures and, being extremely active chemically at such temperatures, they tend to react with the materials of the vessels which hold them. Thus metallic purity is inconsistent.

In the new technique, called levitation melting, compressed metal powder is placed inside a copper coil which carries high frequency current. Reversing its direction roughly a million times a second, it generates a field of force that floats the metal charge inside the coil. Temperatures to 4500 to 5000 F are achieved in half a minute or less, which converts almost any metal into a white-hot molten mass in a matter of seconds. The pure melted metal floats freely in space confined only within itself.

To provide protection from any contamination by air, the whole process is carried out inside a sealed vessel containing an inert gas. With the ultra-pure metals, science will gain fundamental knowledge which will show the way to their full-scale use.

standard machine VS. SPECIAL MACHINE ...a case study

By T. W. Black
Senior Associate Editor

Some of the considerations in deciding whether to use standard or special machines are illustrated in this article, which shows how standard lathes solved several problems in crankshaft manufacture.

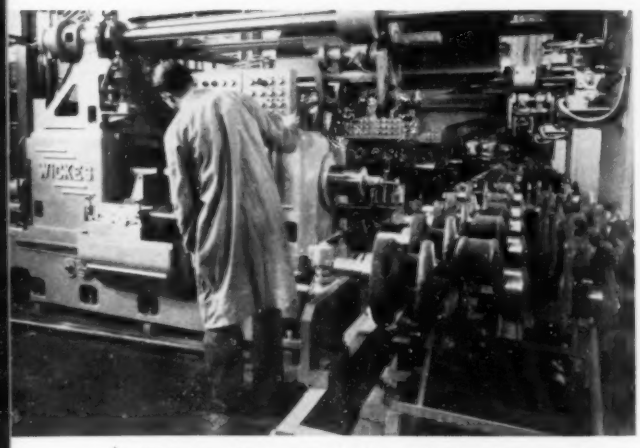


Fig. 1. New crankshaft machining line consists of four double-end-drive lathes of standard design. Crankshafts from the conveyor at right are automatically transported to and from lathe chucks by carriers mounted on overhead rails.

SELECTION OF MACHINE TOOLS for mass production metalworking operations always raises the question of standard versus special-purpose machines. Machines of standard design offer maximum versatility. Special-purpose machines, designed to perform one operation or series of operations on a specific workpiece, usually offer maximum productivity, almost always at the expense of machine versatility.

In recent years, machine versatility has taken on increased importance. Frequent product changes, dictated by keen competition, have materially accelerated the rate of obsolescence of special machine tools. This has been particularly true in the automotive industry, traditionally the home of highly specialized machines.

The trend toward higher horsepowers and improved engine designs has created keen interest in modular machine construction, building-block automation and other methods of combating obsolescence. Many tool engineers in the automotive industry are coming to demand maximum versatility even in special-purpose machine tools. At the same time, they demand maximum productivity.

Present Method: Crankshaft machining operations illustrate this trend. For over thirty years, crankpin diameters have been machined on special

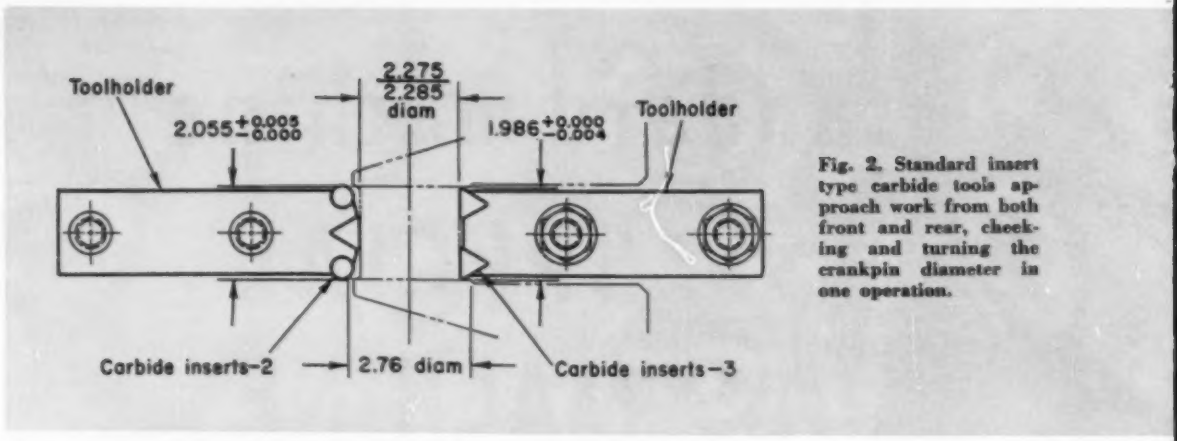
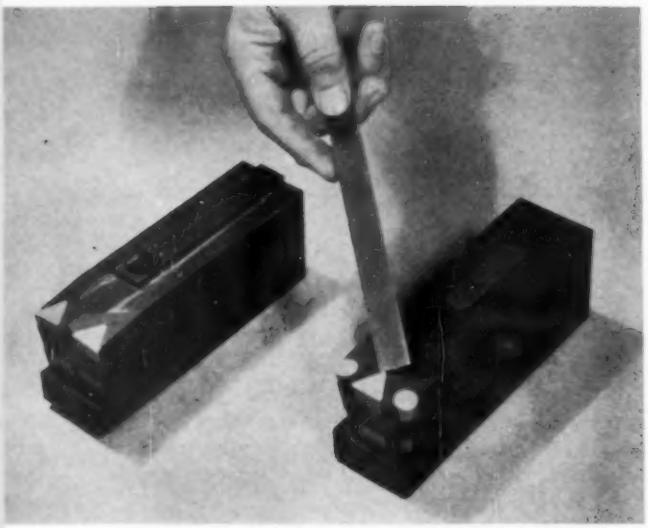


Fig. 2. Standard insert type carbide tools approach work from both front and rear, checking and turning the crankpin diameter in one operation.



double-spindle lathes. These lathes, which accommodate two crankshafts at a time, are designed to machine all pin diameters simultaneously. While such lathes have reached a high state of development, they have several disadvantages. Retooling for a new crankshaft design, for instance, usually involves completely rebuilding the lathe. Conversion requires from one to four months at a cost of as much as $40,000 per machine. A second disadvantage is that the double-spindle lathes are designed to operate at a maximum of 80 rpm and 40 hp, which severely limits their productivity.

Hourly production is 22 to 25 units per hour, using special high-speed steel form tools. There are 16 to 24 cutting tools per machine and these tools must be reground after 40 crankshafts have been run. Tool changes require from 45 to 90 minutes.

Fig. 3. (above) Tool changes involve replacing two toolholders in each machine. Tools are preset.

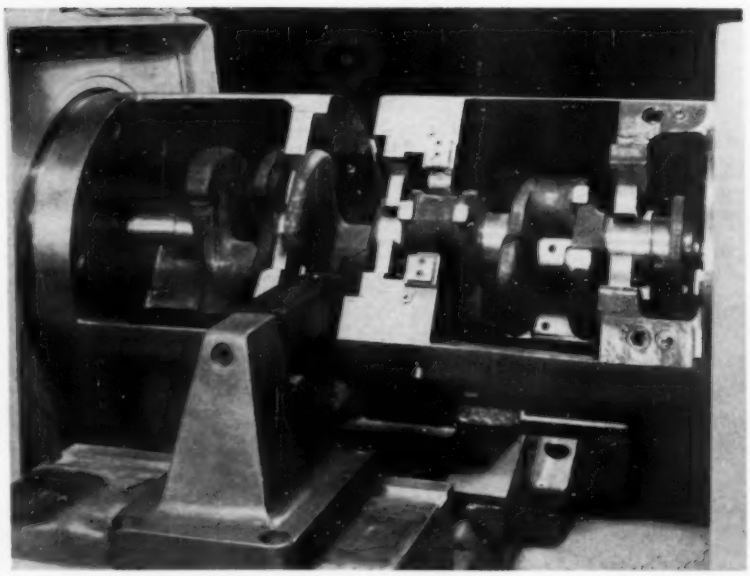


Fig. 4 (right) Crank in position for machining of pin diameter. Heavy fixture provides rigid support, prevents deflection.

Productivity could theoretically be increased with carbide cutting tools, but, to utilize carbides effectively on forged crankshafts, 500 hp would be required. This much power would tear the machine apart.

When these disadvantages were analyzed by engineers at the Machine Tool Div., Wickes Lathe Corp., they concluded that the evolution of double-spindle crankpin lathes had reached a dead end. There appeared to be no way in which these machines could be made more versatile or productive, yet improved crankpin machining methods were a necessity. Accordingly, Wickes engineers decided to abandon the existing concept and find another approach to crankpin machining.

New Method: The first problem was to determine whether or not carbide cutting tools could successfully be applied for crankshaft machining. Forged crankshafts are difficult to machine, by any standard. The forging is rough, the material is hard and crankshafts, although they appear rigid, are easily deflected during machining.

Reasoning that forces tending to deflect the crankshaft would be multiplied at high speeds, Wickes engineers decided to machine one crankpin diameter at a time, rather than four at a time, as is the case with double-spindle lathes designed for V-8 production.

A double-end-drive lathe of standard design was selected for initial tests. These tests proved that carbide cutting tools could be used to machine crankshafts at high speeds. By linking four double-end-drive lathes with automation equipment, a completely automatic crankpin machining line has been developed.

Lathe Design: Each of the four lathes in the line, *Fig.* 1, is powered by a 60-hp direct-current drive motor. Variable-speed drives provide a three-to-one speed range for cheeking or facing and plunge-forming. Feeds are controlled by opposed cross slides for straight plunging or infeed. The slides are activated hydraulically.

Tools in each station approach the work from both front and rear, *Fig.* 2. Two round cutting tools in the front toolholder perform the cheeking operation and a triangular cutting tool performs the plunge cutting operation. Two triangular cutting tools in the rear toolholder assist in plunge forming. The round cutting tools have a negative rake, while the triangular cutting tools approach the work with a zero or slightly positive rake. All cutting tools are standard designs and sizes.

The feed for plunge forming is about 0.0100 inch across the two-inch width of the cut. Since cheeking involves an interrupted cut, feeds are held to 0.040 to 0.060 inch. Depth of cut is approximately 0.250 inch at speeds of 250 fpm.

Tool changes are simple, since they involve removing and replacing only two toolholders per lathe, *Fig.* 3. This can be accomplished in less than five minutes.

During machining, crankshafts are securely clamped in rigid fixtures that revolve between the centers of the lathe, *Fig.* 4. The clamps are hydraulically actuated and clamping and unclamping are completely automatic.

No alterations to the lathe are required when changing over to production of a crankshaft with a longer or shorter throw. The conversion is accomplished by replacing the insert type supporting blocks in the clamping fixture, *Fig.* 5, with others of correct size. Changing these blocks takes only a few minutes. Installation of appropriate cutting tools completes the change-over to the new crankshaft.

Automation: The automated line developed by Wickes consists of four lathes, linked by a conveyor system, *Fig.* 6. Once a crankshaft has been placed on the loading end of the conveyor it is carried through all operations automatically. As it arrives opposite the spindle of the first lathe, it is picked up by a carrier mounted on an overhead cross slide, *Fig.* 7, and transported about five feet into the open chucks of the machine. The lathe then automatically clamps the work and brings the cutting tools into action.

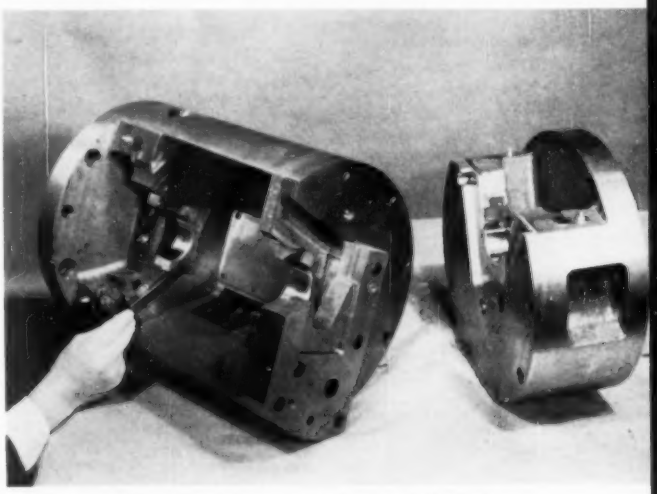
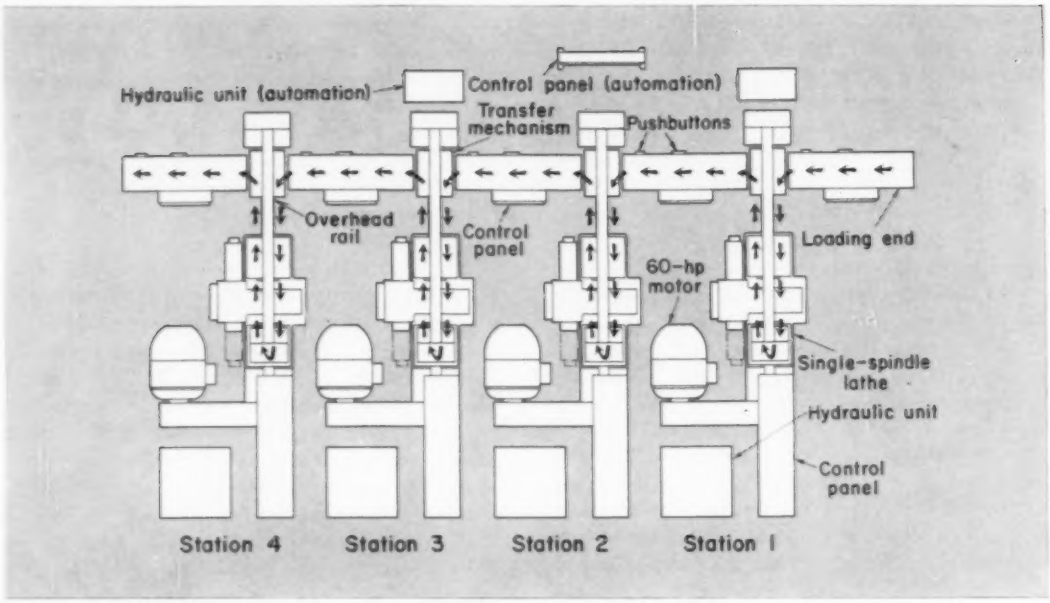


Fig. 5. Conversion to production of crankshafts with longer or shorter throws is accomplished by removing insert type supporting blocks and replacing them with blocks of appropriate size.

When machining of the pin is completed, a second carrier, mounted on a second overhead slide, picks up the crankshaft and places it back on the



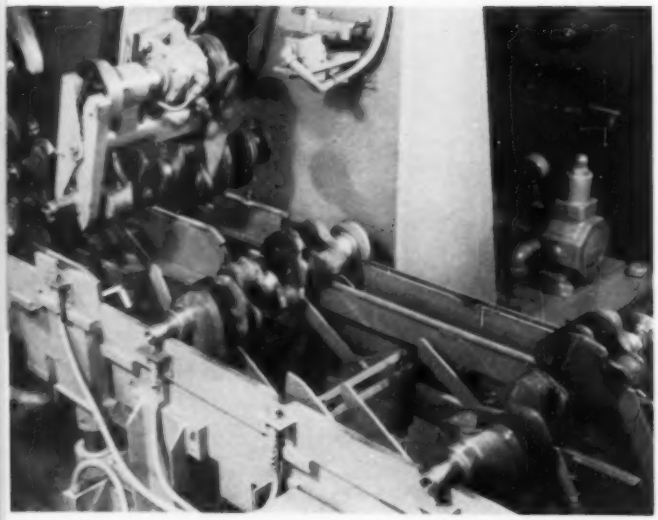


Fig. 6. (above) Automated transfer line for crankshafts. Operation of automation equipment is synchronized with machines.

Fig. 7. (left) Crankshaft is lifted from conveyor by automation device, then loaded into lathe chuck.

conveyor, which indexes the crankshaft toward the next station.

The conveyor holds 32 crankshafts, so there is normally a bank of eight parts at each station. When tools are changed on one lathe in the line, the other lathes continue to operate on the bank of parts.

Cost Comparison: Extensive trials, conducted on a semiproduction line basis, have made it possible to accurately compare the operating costs of the new method to the costs of operating with conventional crankpin lathes. In each case, twelve lathes are required to produce 150 crankshafts per hour. The twelve double-end-drive lathes are grouped in three automatic lines, each manned by one operator, while the twelve multiple-spindle lathes are grouped in pairs with one operator for each two machines. Thus direct-labor requirements are cut in half by the new method.

Cutting-tool costs are also halved, due to the higher productivity of carbide tools. It has been estimated that cost of high-speed steel tools for a production of 150 crankshafts per hour is approximately $20,000 per month. With carbide tools, this cost can be reduced to $10,000 per month.

Floor space requirements are significantly less for the three four-station lines—2700 square feet, as compared to 4800 square feet for conventional equipment. Relative capital investment costs are $840,000 for center-drive lathes and $1,250,000 for conventional crankpin machining lathes. These costs include automatic handling equipment. Retooling costs are estimated at $420,000 for rebuilding twelve conventional machines and $3000 for twelve new machines.

Such savings are exceptional. They demonstrate, however, the value of taking a fresh look at existing processes. The best answer to an individual problem may not always be a special-purpose machine, particularly in industries where product design changes are frequent.

Making Seamless Tubing

. . . at minimum cost

By Victor Roth*
New York, N. Y.
Alsan Mfg. Co.

Some kinds of heavy-walled seamless tubing can be produced with relatively small investment in equipment. Although the process described was originally developed for gold tubing, it can be successfully used for stainless steel, bronze and other materials.

QUALITY STANDARDS for seamless gold tubing used in the manufacture of wedding bands are high. The bands must be expandable at least $\frac{1}{16}$ of an inch without showing cracks or orange peel and the material must be sufficiently dense to eliminate pinholes or other imperfections that show up after polishing. Also, the bands must withstand the repeated blows of a chasing hammer and, of course, they must contain the required amount of gold.

Traditionally, wedding bands are blanked and pierced from flat-rolled stock. The walls of the resulting washer are then turned up to form a tubular segment. High labor requirements and the large amount of scrap make this process uneconomical. Scrap cannot be remelted indefinitely and, in the case of gold, refining is costly.

With these factors in mind, a research program was started to find an alternative production method that would eliminate scrap. In the method eventually adopted, seamless tubing is cast to approximate size and the desired strength and wall thickness are obtained by rotary swaging. Bands are then cut from the tubing.

Centrifugal Casting: Two casting methods were tried out: centrifugal casting and static casting. The centrifugally cast tubing is four inches long, with a 1.125-inch outside diameter. Wall thickness is 0.200 inch.

Tooling for centrifugal casting is simple, consisting of a mold bored to the desired outside diameter of the tubing. No core is required, since the amount of molten metal poured determines the wall thickness. A nosepiece keeps molten metal from escaping from the mold during casting. Molds are of SAE

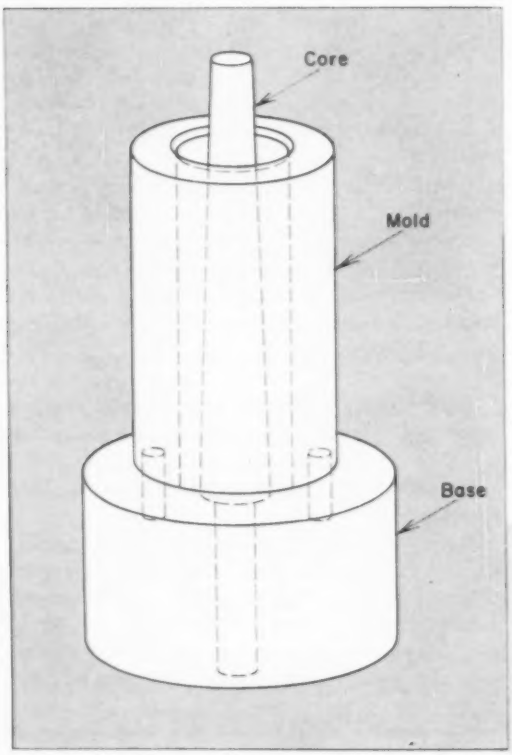
*Senior member ASTE Greater New York chapter.

1020 steel; however, any other low-carbon steel is satisfactory. Casting is done on a standard-design centrifugal casting machine.

A slurry consisting of 97 percent silica flour and 3 percent Bentonite, mixed with water to 52 Baumé, is sprayed on the heated mold to a depth of $\frac{1}{32}$ inch. The slurry provides a good gripping surface for the liquid metal. Close control over the consistency and depth of deposit of this mold wash is essential to successful casting. Since some of the silica from the mold wash is deposited on the castings, the castings should be passed through an acid bath.

Production rates with centrifugal casting are between 20 and 25 castings per hour. The castings are strong and fine-grained, partially because the molten metal solidifies directionally and also because the molten metal is subjected to forces as high as 60 times gravity as the mold is rotated. Thus the tubing has all the properties of any good pressure casting.

Centrifugal casting of gold tubing has one major disadvantage at present. Some segregation occurs as the tubing is cast. This segregation, which is apparently caused by machine vibration, makes it difficult to control the amount of gold in the product. Pending further investigation of the metallurgical problems involved, centrifugal casting of gold tubing has been abandoned. The generally good properties of centrifugally cast tubing, however, make the process preferable for any application where segregation is not a problem.



Static Casting: Static casting has proved to be an adequate temporary substitute for centrifugal casting. Molds are of SAE 1020 steel, with drill-rod cores, *Fig.* 1. Cores are made with a 1-deg taper and are approximately ½ inch longer than the mold to facilitate handling. Cores are wrapped with asbestos insulation tape, which prevents shrinkage cracks as the cast tube solidifies. The cores are readily knocked out of the castings in a foot press. With reasonable care, both cores and molds will give years of service.

Molds are coated with a silicone compound to avoid erosion and to prevent molten metal from sticking to the walls during pouring. Since the castings shrink away from the mold wall during cooling, there is no possibility of a casting sticking to a mold.

Cores are cleaned with steam or by soaking in hot water. Emery cloth is used to remove stubborn spots, always working longitudinally.

Swaging: Castings are drilled 0.002 inch larger than the finished size to make it easy to slip them over the swaging mandrels. The mandrels, which

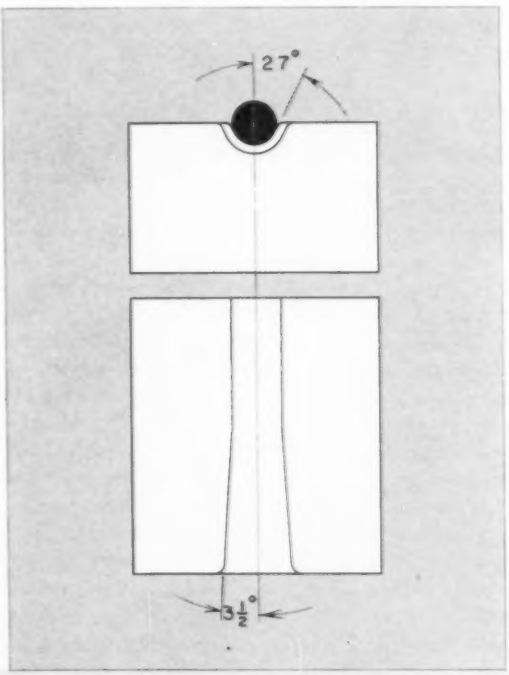


Fig. 2. (above) Swaging die. Taper facilitates entry of tubing. Die area has lapped finish.

Fig. 1. (left) Mold for static casting of seamless tubing. Core is wound with asbestos. Heavy base makes it possible to anchor the core firmly and gives the mold good stability during pouring. Taper is exaggerated in drawing.

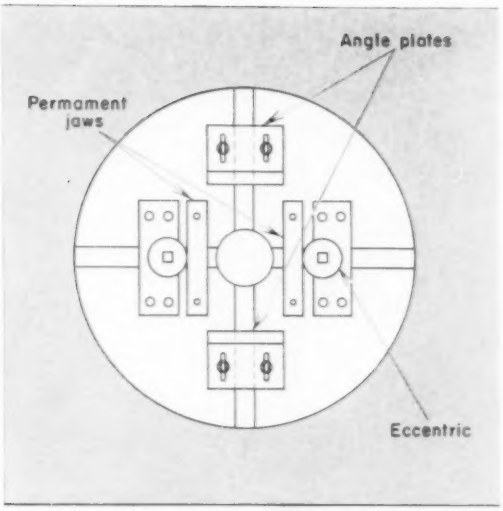


Fig. 3. Setup for machining two halves of swaging die simultaneously. Accuracy is important.

are 16 inches long, are of 52100 steel, hardened to R_C 58. Mandrels of this hardness resist going out-of-round, yet are resilient enough not to snap off during the swaging operation. After hardening, the mandrels are centerless-ground and lapped. Smooth finishes are essential because the smoothness of the inside diameter of the tubing depends entirely on the smoothness of the mandrel. No taper is required on the mandrels, since the cold-worked material develops sufficient springback for easy removal.

Swaging dies, *Fig.* 2, are of tool steel, hardened to 56-57 R_C and form-ground. Like the mandrels, the dies are given a fine lapped finish. Any nicks and scratches will be transferred directly to the outside diameter of the tubing. It has been found that a face-plate fixture, *Fig.* 3, is useful if more than a few dies are to be made. Such a fixture holds and locates the two halves of the die accurately and facilitates making the mouth taper of the dies uniform. A well-made die will swage thousands of tubes and may be ground to a larger size when worn beyond given size limits.

The inside diameter of gold tubing is held to ± 0.001 inch during swaging, despite the fact that wall thickness is reduced from 0.200 inch to 0.085 inch without annealing. The amount of reduction possible at one time can only be determined by experiment. In general, a somewhat greater reduction can be obtained with swaging than with deep drawing. The critical moment for removal of a casting from the machine is when the casting springs sufficiently to make removal easy.

While mechanical feeders are desirable for most types of production, it was found that manual feeding of the swaging machine was fast enough to insure uninterrupted production. The rotary swager is one of the safest types of machines and there is almost no possibility of injury to an operator during manual feeding. Production averages between 80 and 100 castings per hour.

The accuracy of this method of forming tubing, along with the elimination of scrap, has resulted in major cost savings. These savings can be duplicated in other plants where relatively small quantities of precision tubing are required. Similarities between the properties of white gold and stainless steel, and successful experiments with bronze show that other metals can be handled in the same way.

Layout Arrangement Slashes Punching Time

EIGHT MEN used to be needed to drill and finish test tool chassis holes at Martin Co.—now one man does that work, and more too. Reason for the trimmed time is a grid layout table and tracer control device designed by the company for a Wales semiautomatic hole punching fabricator.

Now, instead of manually setting the punch on the proper hole location indicated by a template clamped on the press bed and then moving the punch to the next setting, the fabricator uses a grid layout table and a tracer control unit and works the punch directly from a blueprint. Dies are used to punch holes located in an electronics chassis. An actual-size blueprint is taped on the 30 x 40 inch grid layout table, and blueprint and chassis sheet

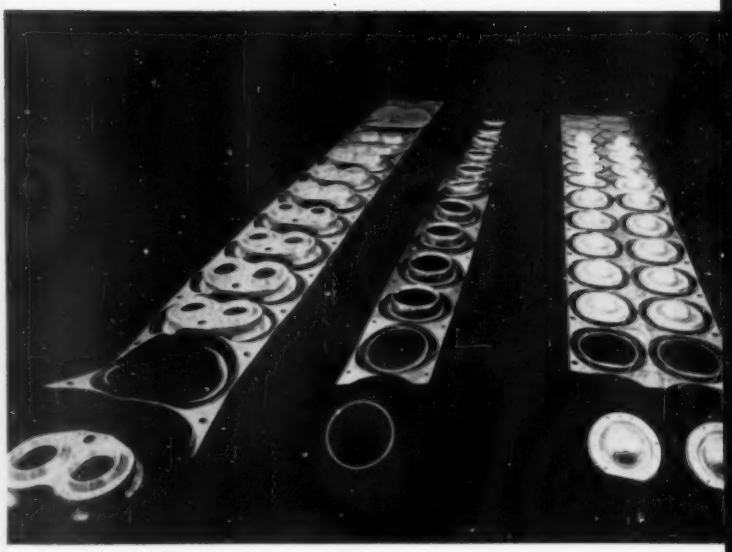


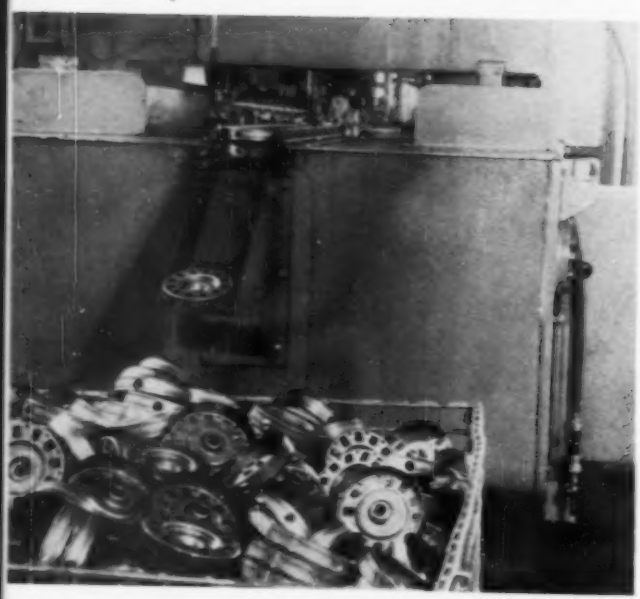
are correspondingly positioned by the centering hole. The tracer is then set on the print in the proper hole location, the control lever depressed, and the hole automatically punched in the sheet metal clamped to the control arm on the press bed.

TOOLS at work

Automation has many definitions because it takes many forms. From a historical point of view, automation represents the trend toward minimizing human effort—mental or physical—in manufacturing. This trend is not new, but it has been accelerated by improvements in controls, in the actuating mechanisms which respond to those controls and in machine tools themselves. These improvements have made automatic work handling and automatic control of production operations a reality. Examples of automation in stamping, machining, finishing and inspection are shown on the following pages.

STAMPINGS for dual headlamp shells flow from output end of 450-ton automatic stamping press at C. M. Small Lamp Co., Detroit. Lower chute delivers stampings into conveyor, while cuttings are ejected into tote box. Strips of material demonstrate functions of progressive dies as strip stock advances through press. From left to right, strips are for a single-unit dual headlamp outer shell; a dual headlamp door and twin outer shells for dual headlamp assembly. In producing these parts, press operation was at rate of 20 strokes per minute. Fully automatic operation makes possible a production rate of 2000 stampings per hour.



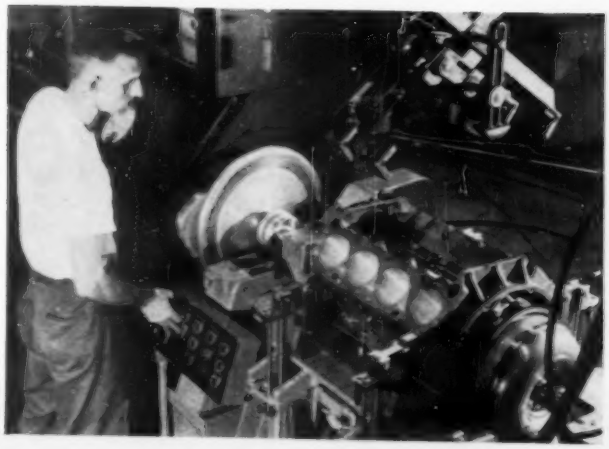


TEN-STATION 600-ton automatic transfer press is used to automatically blank, form, pierce and trim motor end bells complete at rate of 25 per minute. A shuttle type positioning rack runs the length of the press. After each operation of the press, a pair of arms closes on each end bell from two sides, moves it one station, positions it accurately on the die, retracts and then the rack returns to its original position. A sensing pickup shuts off machine if any end bell is not properly positioned. To protect the operator against injury, an electronic eye shuts off the machine if any part of his body approaches a danger position with respect to the machine. Parts coming off the end of the line drop directly into container. Press is at the Westinghouse Upper Sandusky plant.

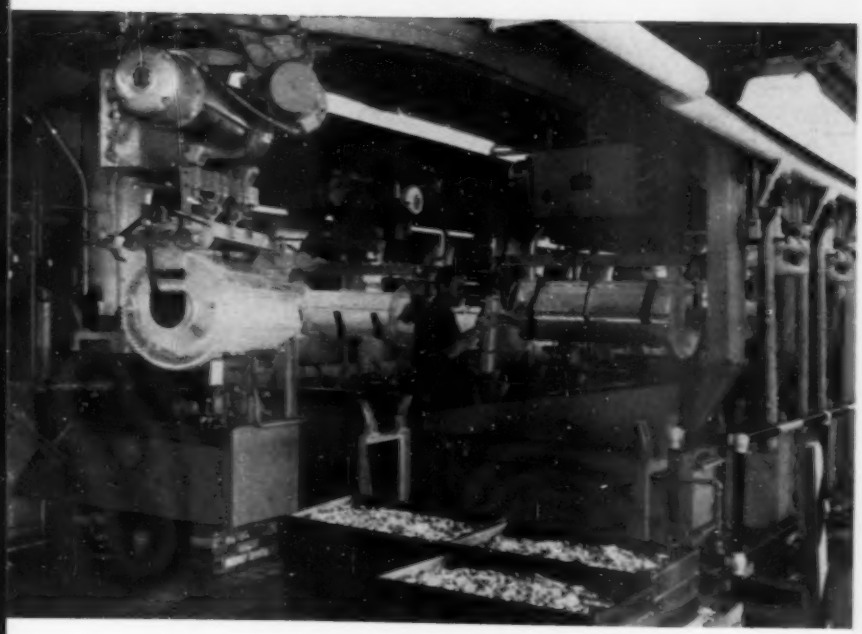




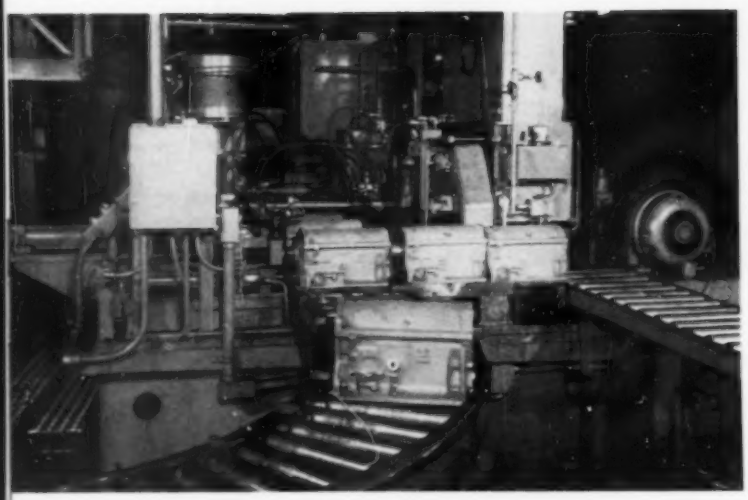
ELECTRONICALLY controlled Bliss contour roll lathe at Inland Steel Co. is used for dressing backup rolls and turning structural rolls. Swing is 48 inches. Follower control mechanism is so sensitive it can duplicate the contours of a master template within 0.001 inch.



CHRYSLER V-8 ENGINES are dynamically balanced after all rotating parts are assembled. The crankshaft is spun at high speeds to reveal any unbalance. By drilling out metal or welding on small weights, similar to the weights added in wheel balancing, any unbalance is corrected.

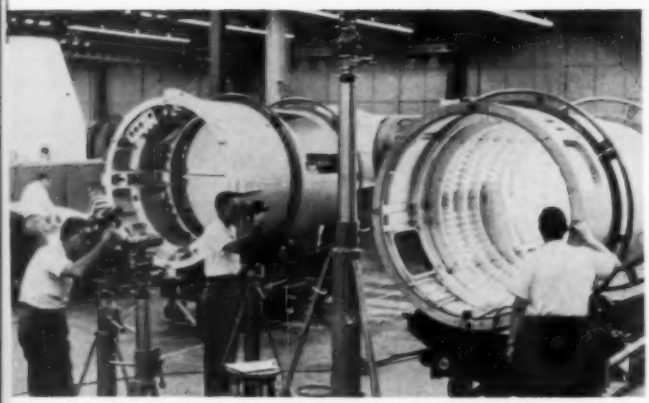


OPERATOR guides plastic barrel of parts into first phase of plating process at Gillette Safety Razor Co. When barrel is loaded into tank, a limit switch actuates a remote timer which is preset to any desired time from 3 seconds to 20 minutes. At the end of the elapsed time, a signal light and bell indicate that the particular operation is over and the load must be moved to the next tank. Yale & Towne hoists and control system eliminate manual operations, other than loading and unloading barrels.

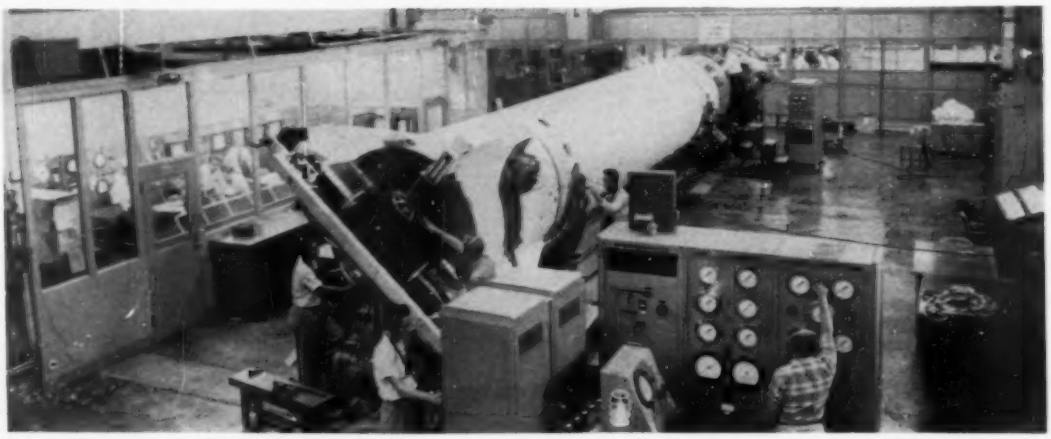


TESTING UNIT at the end of the transmission case line at Chrysler Corp.'s new TorqueFlite transmission plant at Kokomo, Indiana, automatically flushes, dries, plugs, gages and leak-tests under pressure every unit coming off the line. This is the final operation on the line. If a case does not pass the final test on the Apex unit, the machine automatically pushes it off onto a repair line. Cases passing the test travel down the gravity roller (foreground) and are automatically picked up by an overhead conveyor going to the assembly area.

TOOLS at work



EACH ASSEMBLY of the Army's Redstone ballistic missile, manufactured by Chrysler, must be rigorously checked. Technicians are shown checking the mechanical alignment of top sections of a missile. This section, 29 feet long, contains the control system and warhead. A 34-foot-long bottom section contains the power plant and fuel tanks. After final assembly, the missile goes through simulated flight tests. Hundreds of reports are radioed back to a central control room to engineers who make sure that the missile performs according to design requirements.



Checking Master Gage Blocks
—with an interferometer

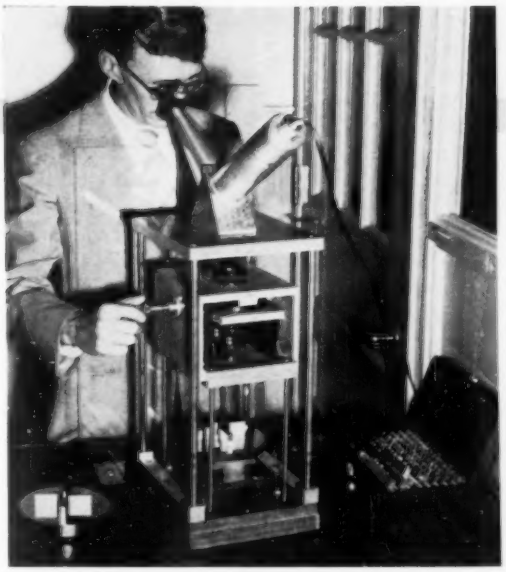


Fig. 1. High-precision interferometer. Gage blocks rest on circular flat plate. White light from the source at top is directed onto tops of gage blocks and plate, then reflected back into telescope eyepiece, producing two different interference patterns.

WITH THE CONTINUING TREND toward closer production tolerances, gage blocks must also be held to closer tolerances. Engineers of the National Bureau of Standards have now developed an interferometric comparator that makes routine comparisons of length to the nearest ten-millionth of an inch. This instrument will be used to check lengths of master gage blocks that control the accuracy of guided-missile, jet-aircraft, machine-tool and similar high-precision parts.

Like other interferometers, the new instrument, *Fig.* 1, determines the relative positions of reflecting surfaces by means of interference fringes formed by light reflected from those surfaces, *Fig.* 2. In this instrument, however, readings are taken directly from a micrometer screw. Visual estimation of fringe displacement is eliminated.

Since the fringes can be produced with light instead of the usual monochromatic sources, the measurement does not depend on the wave length of light used. This simplifies measuring procedures. Other advantages of the design are low sensitivity to vibration and excellent reliability.

To compare the length of one gage block against another, the two blocks are placed side by side on a flat plate, *Fig.* 3. A double prism transmits two beams of collimated white light to the top surfaces of the blocks and the flat plate. After reflection from these surfaces, the two beams are combined at the dividing surface of the double prism, and two separate patterns of interference fringes are formed in the eyepiece of the instrument.

One fringe pattern is within the outline of the superposed images of the gage blocks; the other is formed by the images of the flat plate. If the gage blocks are of equal length, the two fringe patterns will coincide. If there is a difference in length, the fringe patterns will be proportionately displaced relative to each other. The observer then uses a micrometer screw to move portions of an optical wedge system until the two fringe patterns successively coincide with the cross hair in the eyepiece. The distance from one point of coincidence to the other is read from the micrometer and converted into the corresponding difference in gage block length by means of a previously determined calibration constant.

In comparing the fringe patterns for coincidence, no prior knowledge of the approximate difference in gage block length is required. The white light pattern provides a characteristic color for the reference fringe in each pattern.

There are four wedges in the optical system, two in each of the interfering beams. The wedges that are paired together are matched in both wedge angle and index of refraction. One wedge from each pair is attached to a movable stage driven by the micrometer screw. Rotating the micrometer screw through the proper distance then causes a differential change in the optical paths of the two beams, bring-

ing the interference patterns into coincidence with a cross hair.

Wedge angles can be chosen so as to provide a convenient calibration constant between micrometer screw rotation and the change in optical path. In the new instrument, the distance indicated on the micrometer is the difference in gage block length, multiplied by 5000.

To keep this calibration constant the same, or nearly so, for the range of visible wave length in the white light used, the wedge pairs are made of glasses having different indexes of refraction. In order to compensate for the glass of the wedges in the opposing beam, a plane parallel plate is inserted in each beam. Each plate has an index of refraction equal to that of the wedge system in the opposing beam, when that wedge combination has been adjusted to compensate for a zero path difference in air. Use of the parallel plates is necessary to retain the white light interference condition.

The calibration constant is relatively invariant with wave length. Thus, the full range of the instrument can be used to compare gage blocks differing in length by as much as two ten-thousandths of an inch.

Statistical analysis methods were employed to determine the precision attainable in practice. The analysis was based on readings obtained by comparing the lengths of ten gage blocks differing in nominal length by increments of one-millionth of an inch. In the analysis, all possible pairings were taken into consideration, even though only a limited number of pairings were actually measured directly. The results confirmed that the instrument can make individual comparisons of gage blocks to a precision of one ten-millionth of an inch.

Data obtained in this way are being applied in the design of a second interferometer for measuring the absolute length of the Bureau's primary standard gage blocks. Variables that must be controlled in the absolute measurement include pressure, temperature and humidity of the air; temperature and thermal expansion coefficients of the gage block material; and the phase change occurring at reflection from the surfaces of the gage block and the flat plate. This phase change is a function of the material and the surface finish.

For routine comparison of gage blocks, these variables are much less significant. In the present comparator, optical paths and the gage blocks being measured are in close proximity, minimizing temperature effects. In addition, the gage blocks can be conveniently interchanged between the two light beams, thus canceling the effects of constant temperature gradients and residual effects due to the optics of the interferometer. Also, since measurements are made at two points closely spaced in the field of the interferometer, requirements for constancy of surface on the optical parts and the flat plate are less stringent.

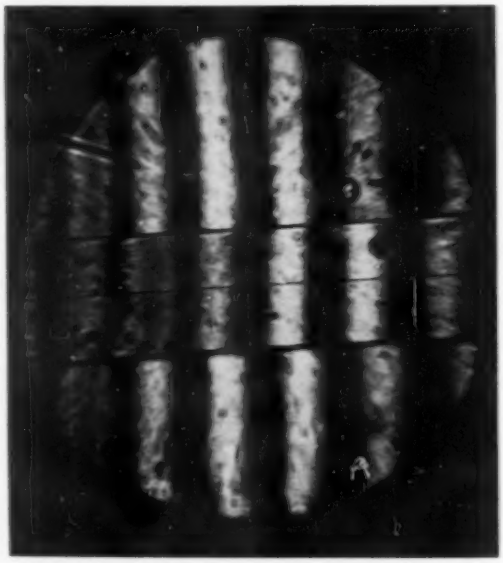


Fig. 2. (above) Two interference patterns formed in eyepiece of comparator. The inner rectangular pattern is within the superposed images of the two gage blocks; the outer circular pattern results from the images of the flat plate.

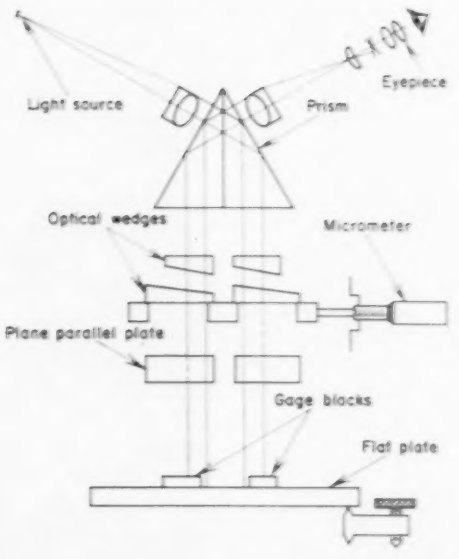


Fig. 3 (right) Schematic diagram of interferometric comparator. The difference in gage block lengths is measured by the horizontal distance through which optical wedges must be moved to bring the two interference patterns successively into coincidence with a cross hair in the eyepiece. Wedges and micrometer are rotated 90 deg for illustration.

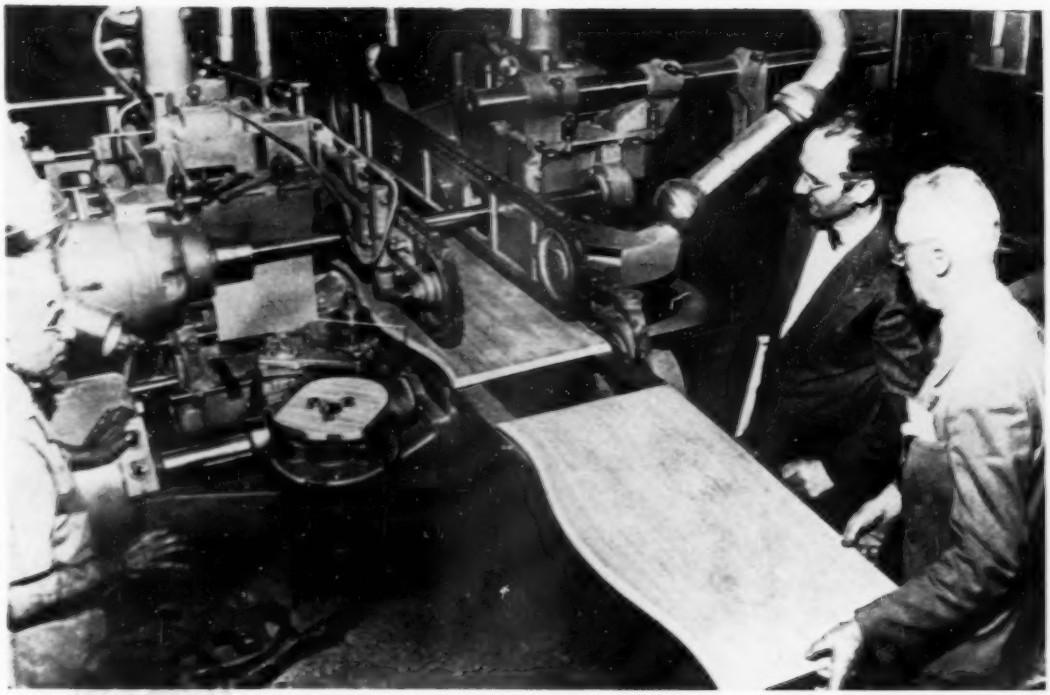


Fig. 1. Outfeed end of a double-end tenoner that is equipped with an automatic shaping attachment. The hardwood cam is visible in the foreground. This cam shapes "eyebrow" curves on front edges of furniture tops.

WOODEN CAMS SAVE MONEY

By John E. Hyler
Peoria, Ill.

ALTHOUGH THEY ARE not now used extensively, hardwood plywood cams perform well when they are correctly applied. Two interesting uses of such cams on woodworking machines illustrate their possibilities. Wooden cams could serve equally well on other types of machines, especially if densified woods were used. Two of their biggest assets are ease of fabrication and low cost.

A type of machine used in the woodworking industry is called a double-end tenoner because it was originally used to simultaneously cut tenons on both ends of wood parts as they were fed crosswise through the machine. Parts are carried through these machines, *Fig.* 1, on top of a pair of feed chains that run in synchronism. The feed chains are equipped with dogs to positively push the workpieces. Through the years, double-end tenoners have been used for different types of operations and special attachments have been developed to expand their utility.

One of the most interesting of these is an automatic shaping attachment, developed by Greenlee Bros. & Co., for cutting coves or other irregular contours on workpieces enroute through the machine. The shaping attachment comprises a cam-

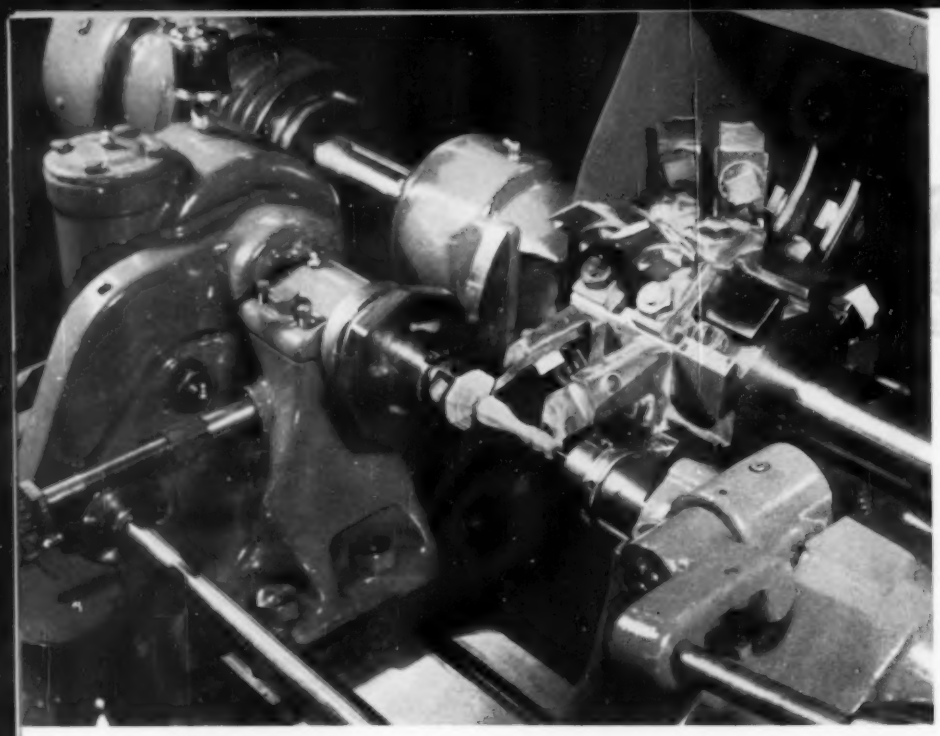


Fig. 2. Looking down into the working area of a Mattison Machine Works automatic shaping lathe. The wooden cam on the workpiece headstock is generating an octagonal shape on wooden candlesticks.

operating gear case, a cam-roller lever and the shaping head. An additional unit makes it possible to cut the cam by using a workpiece as the pattern.

The cam-operating gear case holds a wooden disk cam, which controls the movement of the shaping spindle. The camshaft is geared directly to the workpiece feed drive shaft. This insures synchronism so one revolution of the cam represents 64 inches of feed-chain travel. For such a setup and with long workpieces, dogs would be placed 64 inches apart.

The cam-roller lever transmits cam action through a segment gear to the shaping spindle, moving the spindle toward or away from the work as required. A counterweight keeps the cam roller against the cam at all times.

With dogs spaced 64 inches apart, workpieces should be no longer than 60 inches. If the workpieces are less than 30 inches long, dogs can be spaced 32 inches apart and two parts can be cut per cam revolution. Depending on the operation, workpieces can be stacked for multiple shaping.

Cams are made with the machine by using a pattern of the part and the cam-forming attachment. The latter consists of a driving motor and a helical cutter. The cam-roller lever is replaced by the cam-forming attachment so the helical cutter occupies the same location as the cam roller normally does. When a collar of the same diameter as the shaping cutter is placed on the shaping spindle and the pattern is fed through the machine, the helical cutter generates the required cam. The counterweight holds the helical cutter against the cam blank.

Wooden cams are inexpensive and easy to make, and they are sufficiently durable to produce thousands of parts on production runs. Where both sides of a workpiece require irregular contours, two shaping units and two cams are used with the double-end tenoner machine.

Wooden cams can also be used successfully on automatic shaping lathes for wood parts. They will not stand up under long runs but have sufficient accuracy for short runs. They are especially useful when a few identical parts are needed quickly. Skilled operators are not required.

Automatic shaping lathes are equipped with a cutterhead mandrel, *Fig.* 2, on which are mounted one or more cutterheads equipped with shear-cutting knives. This mandrel revolves at high speed but has no other motions. Workpieces are held between centers that are mounted on a swinging carriage. The blank is revolved slowly as it is moved toward the cutterheads by the operator.

For workpieces with circular cross sections, no cams are needed. The operator merely swings the carriage toward the cutterheads until the preset stop is reached. Cams are used for shaping noncircular parts.

Two screws are provided on the workpiece headstock spindle so that a cam can be mounted on it. A curved cam shoe is mounted on the machine frame opposite the cam location. Regular carriage stops are withdrawn during shaping of noncircular parts because the cam and shoe act as the carriage stop. Action of the cam is to swing the blank-holding centers toward and away from the cutterheads. The number of sides on the turning is the same as the number of sides on the cam.

solving machining problems with CHEMICAL MILLING

By Arthur Colton*
Assistant Editor

Chemical milling is a new process for precision sculpturing of metals by chemical reaction. Although the process is a radical departure from conventional methods used to produce aircraft parts, its ability to produce odd-shaped parts at low cost has led to many practical engineering applications.

PRECISION MILLING of aircraft and guided missile parts without the use of machines is now possible through a new chemical process, called chemical milling. This process is not intended to replace all machining operations but it does permit shaping new and unconventional part designs at low cost.

Basically, chemical milling is an etching process. It is presently used to execute complex engineering designs by masking certain areas of a workpiece and then lowering the part into an acid etching bath. The etchant dissolves the unmasked material to form the desired contours. Chemical milling is a chemical process as distinguished from an electrochemical method. The latter would limit the size of the workpiece to be "milled" because of the amount of the current required. Chemical-milling is limited only by the size of the tank.

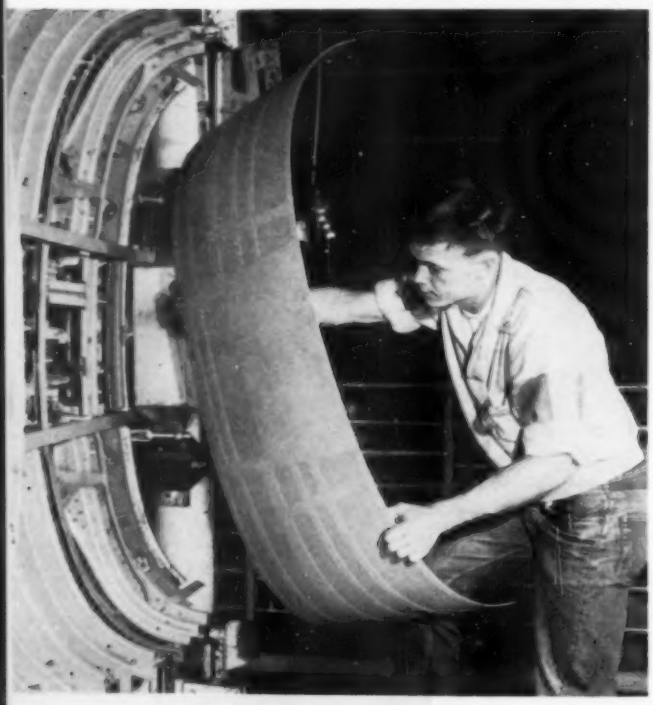
*Now Staff Administrator—Standards, American Society of Tool Engineers.

Development of Process

Chemical milling was first conceived by Manuel Sanz, Chief Scientist of North American Aviation Company's Missile Development Division. The product that prompted experimentation with the process was a rocket casing. A cylinder made of thin sheet aluminum had to be butt welded at the seam where the edges of the rolled sheet met. However, the weld kept failing because of the thinness of the edge of contact. Use of a thicker aluminum sheet would have made the casing too heavy. Numerous attempts were made to get around the problem without success. Sanz conceived the idea of making the cylinder of heavy gage aluminum and reducing the thickness of the sheet by immersing the workpiece in a chemical bath. The edges of the sheet were covered

with tape of a resistant material so that a lip of the original sheet thickness would be left for the weld. The end result was the development of a practical means of fabricating lightweight formed contour parts.

Although there is still much to be learned about chemical milling and many process improvements to be made, the process is well past the experimental stage. It is now being used to produce hundreds of parts for aircraft and missiles through some 48 companies licensed to produce these parts by chemical milling. Applications for this process are now being employed by industries outside of aircraft. For instance, auto manufacturers are sizing up the design possibilities. Architectural designers can use the sculptured effect of chemical-milling to produce some unusual designs. Color can be added through anodizing. In all, the range of design possibilities is limited only by the size of the tank in which the etching takes place.



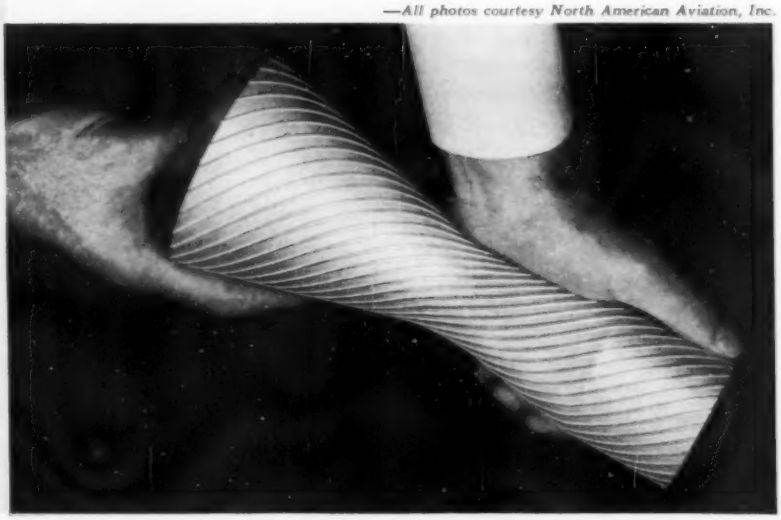
The basic steps in chemical milling are cleaning, masking, etching and demasking. Cleaning is accomplished by submerging the parts to be etched in several cleaning baths. The parts are degreased, cleaned with hot mild alkali, rinsed in cold water, deoxidized (in the case of aluminum), rinsed in hot water and dried. Cleaning must be thorough to insure uniform adhesion of the maskant and uniform dissolution of the metal. Special care must be taken to be sure all the lubricant is removed from formed parts before applying the masking.

In masking, the clean, dry parts are either dipped in a maskant, flow coated or roller coated. Usually they are coated with several layers of the maskant. This is because a single pinhole in the coat would ruin the etching job. After the maskant has been dried and cured, a template corresponding in size and shape to the areas of metal to be etched is superimposed on the masking film. A knife is used to scribe around the template, cutting only the film and not the workpiece. The cutout area of masking film is then stripped away by hand and the piece is ready for the etchant bath. Maskants are normally

—All photos courtesy North American Aviation, Inc.

A portion of an F-100 Super Sabre air duct (above) after chemical milling, being placed in jig for further operations.

An intricately fluted part (right) for a rocket engine produced by chemical milling.



of the neoprene rubber type but recently vinyl plastics have been used. However, if chemical-milling is to become a truly mass production method of metal removal, additional research will have to be done to find a faster and more suitable method of masking.

Parts to be etched are placed in a basket or fastened in a rack and lowered into the etching tank. Metal removal is approximately one mill (0.001 inch) per minute of immersion in the etching solution. This etching rate depends on the concentration of etchant in the bath. As the etching progresses it is necessary to replace the chemical ingredents to maintain positive balance of the chemicals. Also it is necessary to remove the metallic salts created by the reaction of the etchant with the metal. Controlling the speed of etching is accomplished by adjusting and maintaining the strength and temperature of the solution, and by constant agitation so that all surfaces to be etched are covered evently by the etchant. Some manufacturers have tried out ultrasonic agitation of solutions to facilitate etching.

One problem that must be considered is the undercutting of the metal along the edge of the masked area. If the chemicals eat under the masked edge smoothly and uniformly, it rounds the milled edge and makes it stronger. Gas bubbles or sediment collecting in the etched pocket may cause the chemical to eat unevenly. This produces a jagged edge and reduces material strength.

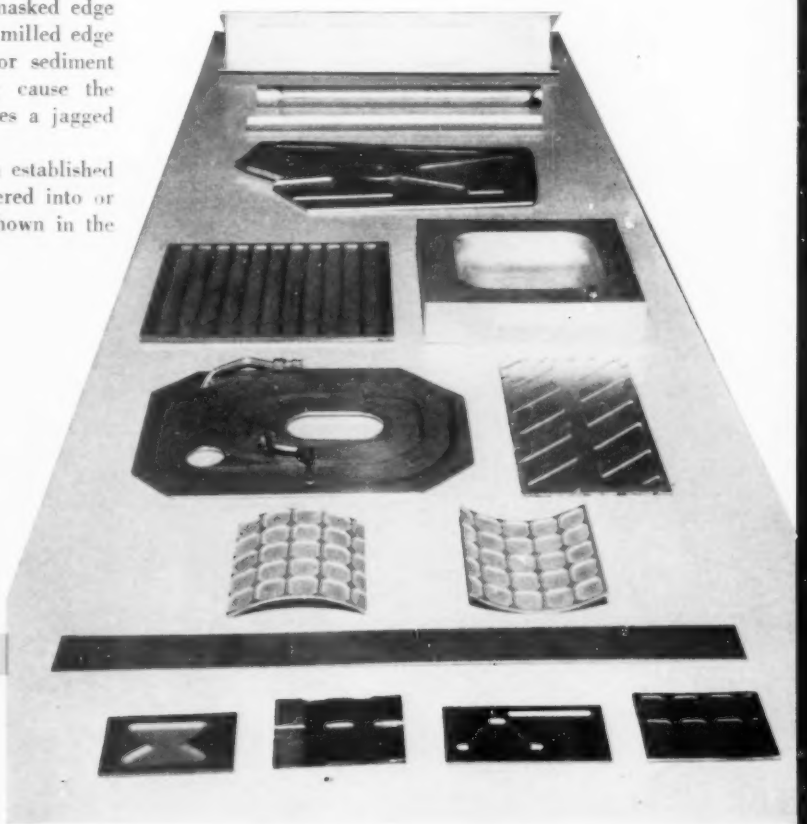
Product designers must allow for an established tolerance when the work is being lowered into or raised from the etching solution, as shown in the accompanying table. Tapered parts with exceptionally close tolerances can be chemically milled by lowering the part into the etching solution, then lifting it out at a predetermined rate. This allows the etchant to act progressively longer on the portion still under the surface. A rapid immersion produces a small taper angle and a slow rate of immersion produces a large taper angle. A conical taper or semisphere can be milled by the varied rate of removal. Also it is possible to taper metal sheets by placing them into and removing them from the solution at a predetermined angle. To help with this, there are mechanical hoists available that will automatically raise or lower the parts at a steady rate.

After the etching process has progressed for a set time, part of the masking can be removed and the workpiece put back into the solution. By this method different amounts of metal can be removed from different areas of the part. When a certain thickness of metal is required to provide proper metal flow during forming operations, the excess metal can be chemically milled away after forming.

Etching solutions vary with the type of material

Etching Tolerances

Depth of Etch (inch)	Tolerance (inch)
0.000 — 0.030	± 0.002
0.031 — 0.060	± 0.0025
0.061 — 0.090	± 0.003
0.091 —	± 0.004



An assortment of chemically milled aluminum parts for missiles.

used. Modified caustic solutions are generally used for aluminum. However, North American Aviation's Columbus, Ohio plant is using hydrochloric acid as a production etchant for aluminum. This procedure permits fine etching. New methods for recovery of dissolved aluminum promise to cut over-all manufacturing costs in the chemical milling process. Normally, however, caustic type etchants are used on aluminum alloys, and acid type etchants on steel, magnesium and titanium alloys. Acid type etchants are contained in mild steel tanks with plastic liners. All other solutions are contained in unlined mild steel tanks.

Action of the etching solution leaves a black smut on the surface of the part. This is removed by immersing the part in a deoxidizing solution. After deoxidizing and rinsing, masking is removed and the part is complete.

Typical Applications

Generally, the best application for chemical milling is in the removal of large areas to a depth of not more than 0.5 inch. While tolerances of ± 0.001 inch are obtainable, the holding of such close tolerances raises the cost. Length and width tolerances of ± 0.060 inch and thickness or depth of cut tolerances of −0.000 + 0.005 inch will be found to be more practical.

Etched surfaces will be from 30 to 125 microinches in smoothness although a great deal depends upon initial surface finish, depth of cut and type of material. One rule to remember is that as the depth of cut increases, the final finish becomes rougher.

New installations of chemical milling are rapidly appearing in various sections of the country. Beech Aircraft Corporation is now producing parts by this method in their plant No. 1 at Wichita, Kansas.

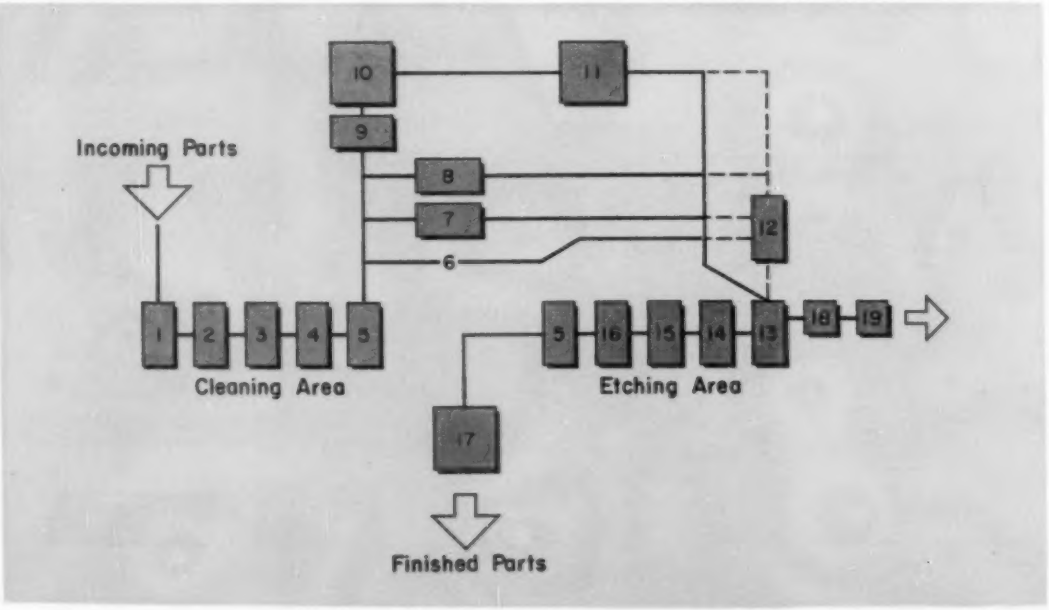
At the Manhattan Beach Plant of the United States Chemical Milling Corporation, chemical-milling has taken on a new look. In addition to six horizontal tanks, a vertical tank has been installed. This tapering tank, which extends 60 feet underground, was installed with its accompanying facilities to meet the increasing demand for extremely long tapered structures in the design of advanced aircraft. With aluminum wing spars, for example, the tank has to be as deep as the spar is long. The installation of this new tank now makes it possible to taper parts 55 feet in length and 11 feet in diameter.

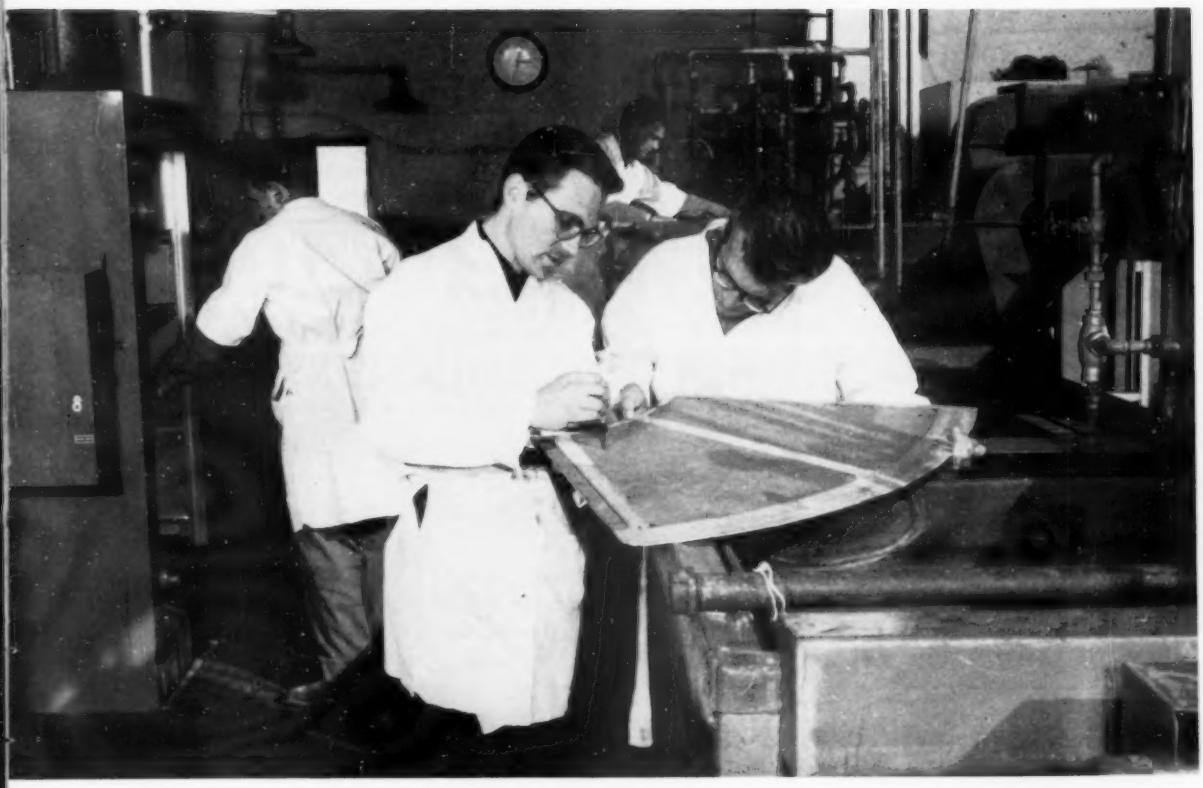
Eleven corrosion-resistant rings, 6 feet high by 12 feet in diameter were placed into the ground to form the tank shell. The botttom four rings are fabricated out of ⅜-inch steel while the remainder of the rings are 5/16 inch thick.

Although the exterior of the tank was coated with

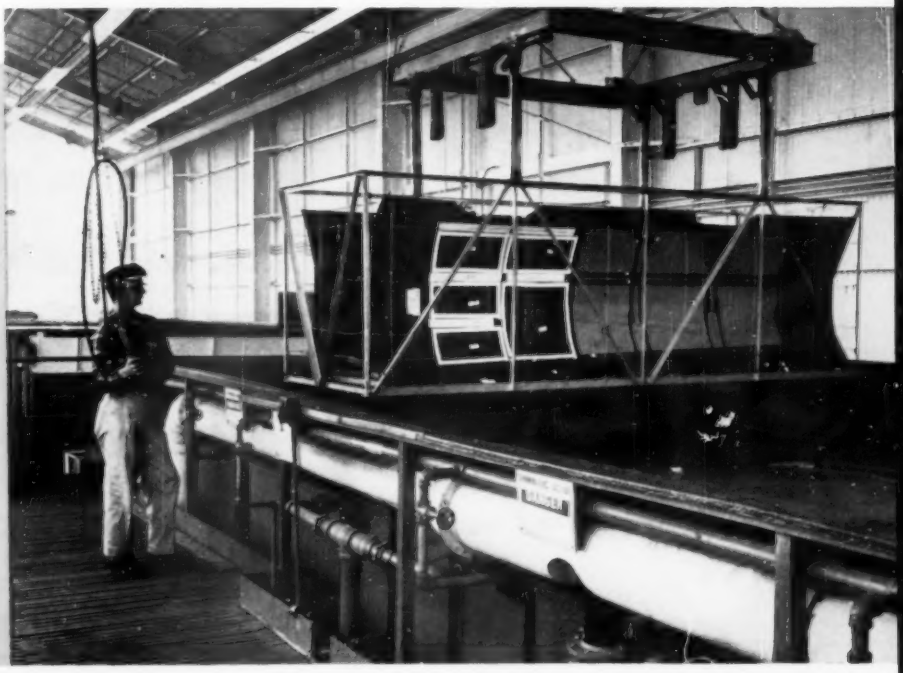
Diagram shows the typical steps necessary to the chemical milling process. This is a basic installation. Modifications can be made to suit individual problems.

—Drawing courtesy North American Aviation, Inc.





A typical part for the SM-64 Navaho being measured for thickness after processing.



This large installation is 36 feet wide and 130 feet long, is equipped with cranes to lower parts into the solution. Tanks are large enough to handle 4x12-foot sheets formed to any shape and 30-foot longerons to be tapered.

a preservative before it was fabricated, additional protection is used in the form of an anodic system to prevent any external electrochemical reactions from eating away the tank shell. Four 25-pound magnesium bars are attached ninety degrees apart on the exterior of the tank. These four bars are connected electrically and grounded to provide the necessary protection. In time electrolysis will eat away the bars, leaving the surface of the tank undamaged. No protection is needed for the interior of the tank since the chemical solution used as etchant for aluminum acts as a preservative for steel.

Chemical milling is still in its infant stage but designers are beginning to realize the vast potential this method of "machining" offers. New shapes and designs, impossible with conventional machines, are now possible. The only limiting factor is the size of the installation. As the process becomes more widely known it will undoubtedly be used by other industries. By greater study and utilization of this process one can effect a variety of savings in engineering, planning, tooling and manufacturing.

Acknowledgements

The cooperation of the following companies is herewith gratefully noted:

North American Aviation, Inc.....Los Angeles, Calif.
Chem-Mill* Division

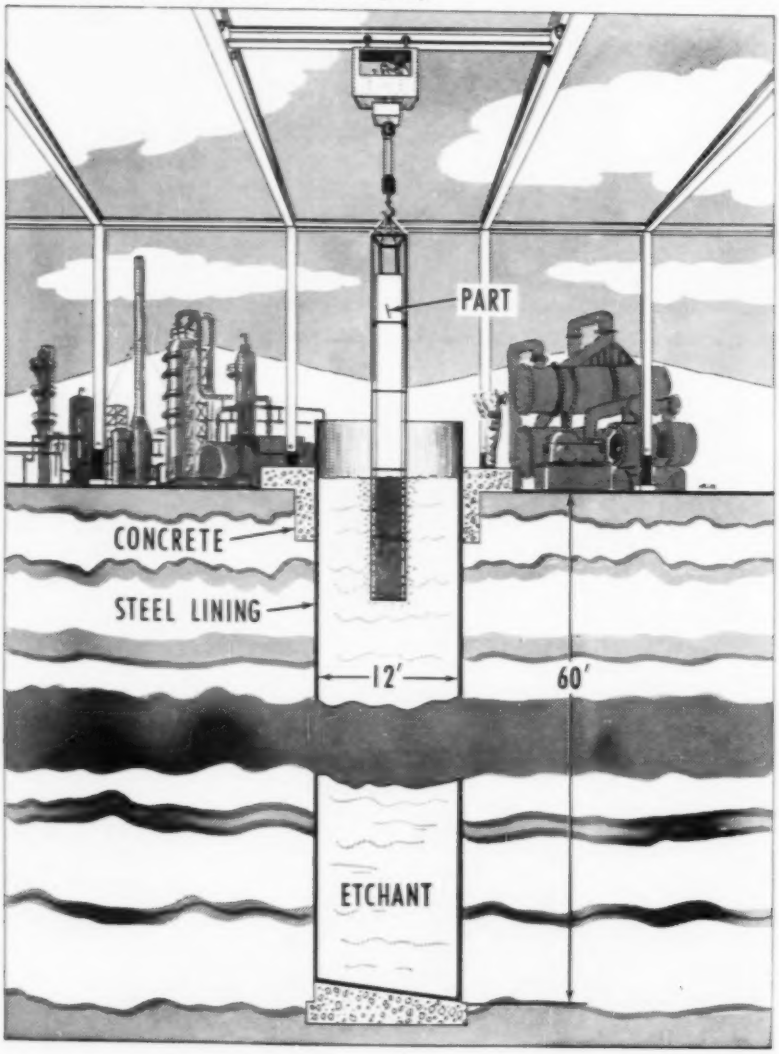
Turco Products, Inc.....Los Angeles, Calif.

Beech Aircraft Corp.....Wichita, Kansas

United States Chemical
Milling Corp.....Manhattan Beach, Calif.

*Chem-Mill is a Registered Trade Mark of North American Aviation, Inc., licensed to Turco Products, Inc.

—Drawing courtesy United States Chemical Milling Corp.



Drawing of verical tapering tank for chemical milling.

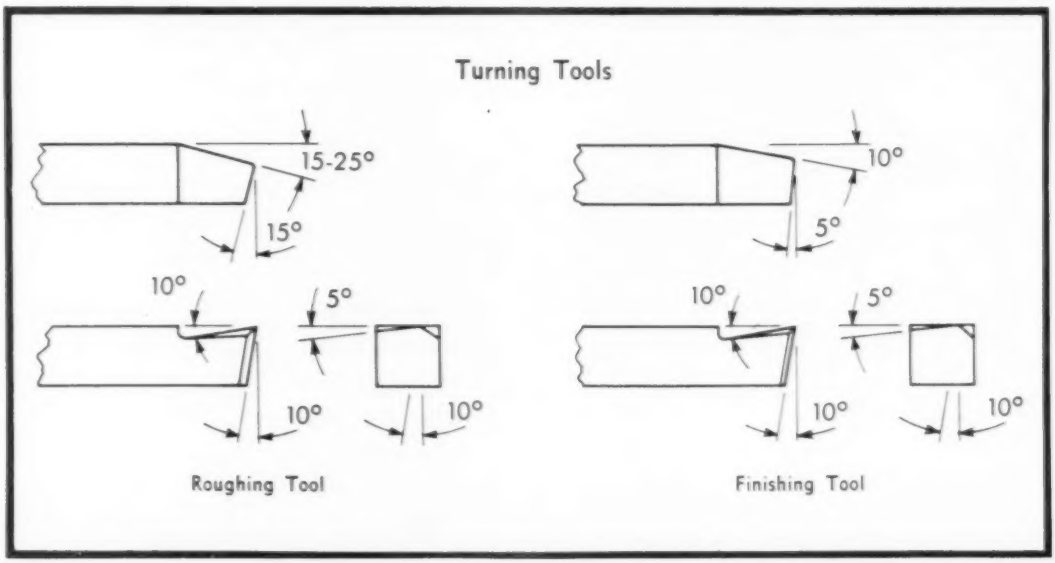
TOOL DESIGN
...for machining magnesium

MAGNESIUM AND ITS ALLOYS are highly machinable, permitting metal removal at the highest rates of speed obtainable on modern machine tools. The power required to remove a given amount of metal is lower than for any other commonly machined metal. Excellent surface finishes are obtained because there is no tendency for the metal to tear or drag. These characteristics of magnesium alloys, plus their light weight, which allows efficient handling of large parts, permits economies in machining operations.

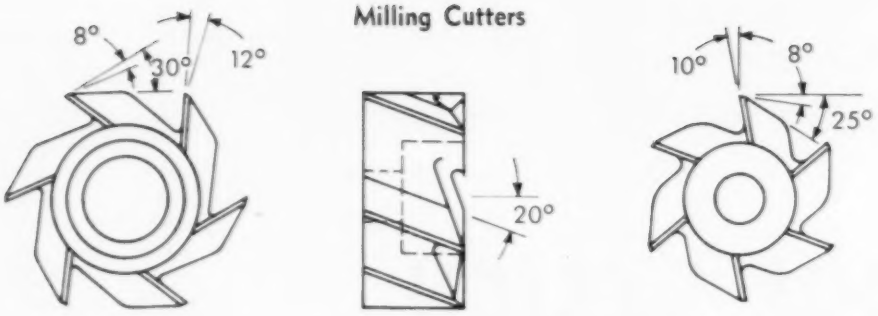
Although cutting tools designed for machining other metals give satisfactory results when cutting magnesium and its alloys, best results are obtained with tools designed to take full advantage of the characteristics of magnesium. Suggested tool designs for the various machining operations used on magnesium alloys, such as milling, drilling and others, are shown on the following pages.

Data furnished by the Magnesium Dept., The Dow Chemical Co., Midland, Mich.

Typical Tools for Magnesium



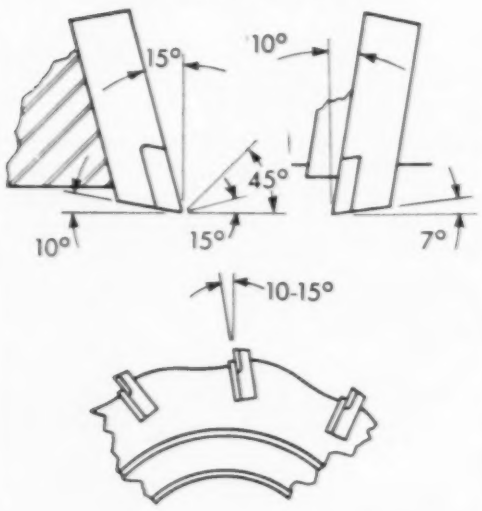
Milling Cutters



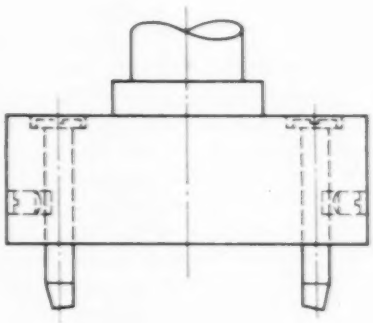
Coarse-Tooth Cutter

Shell End Mill

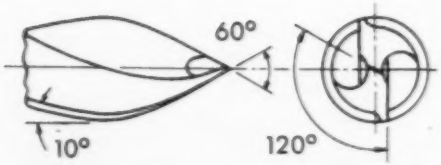
Inserted-Tooth Face Mills



Two-Blade Fly Cutters

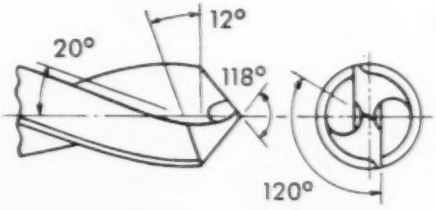


Sheet Drills



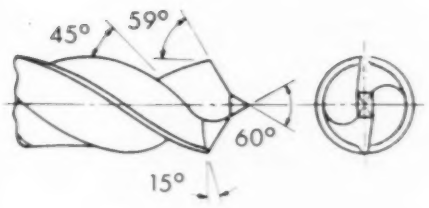
Drill Element	Recommendation
point angle, deg	60
helix angle, deg	10
chisel edge angle, deg	120 to 135
web	thinned at point
corners	rounded

Shallow-Hole Drills



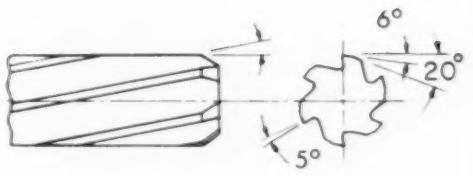
Drill Element	Recommendation
point angle, deg	70 to 118
helix angle, deg	10 to 30
chisel edge angle, deg	120 to 135
relief angle, deg	12
corners	rounded
flutes	polished

Deep-Hole Drills



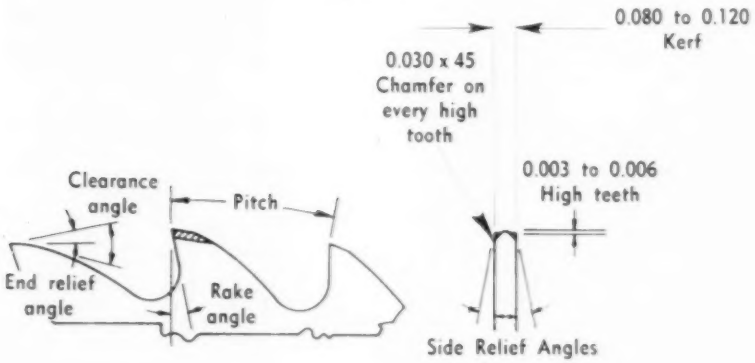
Drill Element	Recommendation
point angle, deg	118
helix angle, deg	40 to 50
chisel edge angle, deg	135 to 150
web	constant thickness
flutes	open and polished
point, deg	118 plus spur

Reamers



Reamer Element	Recommendation
helix angle, deg	0 (straight) or 10
rake angle, deg	5 to 8
relief angle, deg	4 to 7
clearance, deg	15 to 20
margin, in.	0.010 to 0.025
flutes	4 to 6

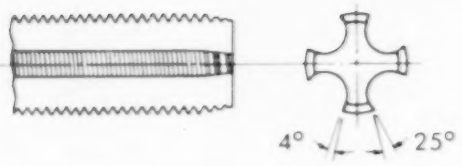
Saws



Saw Element	Saw Type — Circular*	Bandsaw	Power Hacksaw	Hand Hacksaw
Pitch (teeth/in.)	½-4	4-6	2-6	12-18
Tooth Set (in.)	None	0.02-0.05	0.015-0.03	-
End Relief Angle (deg)	9-11	10-12	-	-
Side Relief Angle (deg)	1-1½	-	-	-
Clearance Angle (deg)	20-30	20-30	20-30	20-30
Rake Angle (deg)	15-20	-	-	-

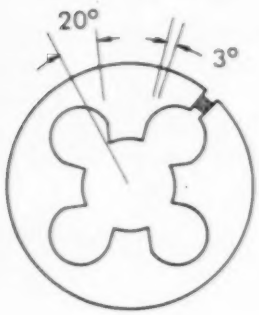
*Straight-tooth or beveled-tooth.

Taps

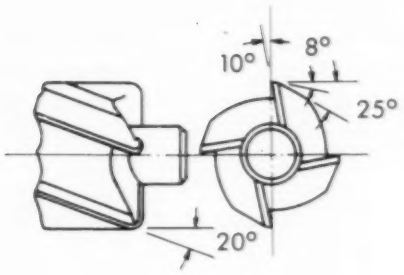


Tap Element	Recommendation
rake angle, deg	10 to 25
heel rake angle, deg	3 to 5
chamfer	2 to 3 threads
lands	cylindrical and narrow
flutes	2 to 4

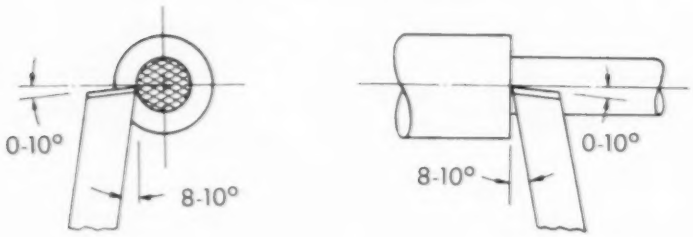
Threading Dies



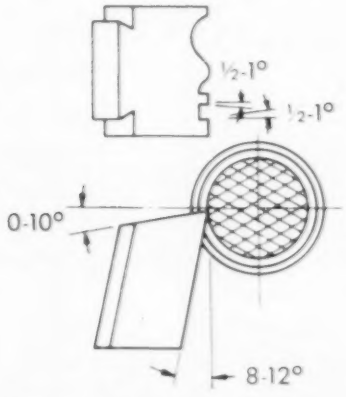
Counterbores



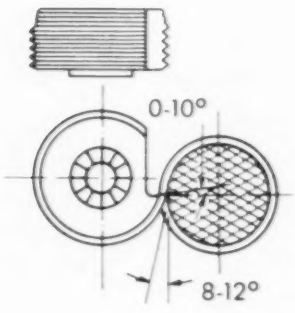
Screw Machine Box Tools



Screw Machine Form Tools



Screw Machine Thread Chaser



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aste



"Tooling for Competition"

keynotes '58 tool show in philadelphia

In a year when competition in the manufacturing field is fierce, and the squeeze on profits is uppermost in men's minds, ASTE's 1958 Philadelphia Tool Show has been dedicated to finding ways of "Tooling for Competition." Meeting the current economic challenge and trying to find the answers to today's decreased profit margins, despite increased sales and expanded production facilities, is the aim toward which much concentrated effort, in all phases of the Society's '58 Convention, is being expended. Tool Show exhibitors, technical program planners, convention speakers—all are focusing their attention on the almost universal problem of meeting, and beating, both present and future competition.

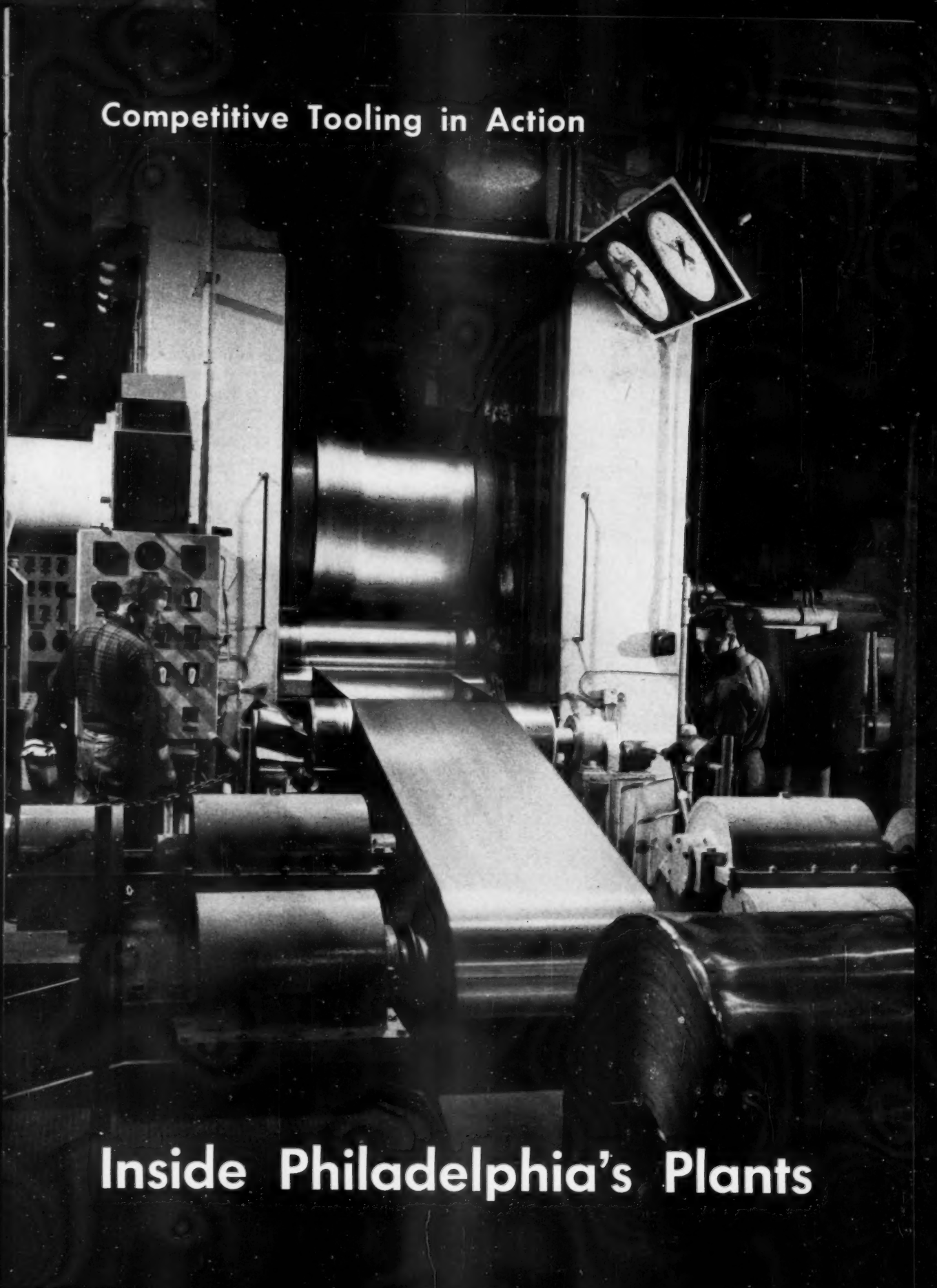
Dwillard J. Davis, vice president of manufacturing of the Ford Motor Company and second Eli Whitney Memorial speaker, who must daily come face to face with the spectre of falling profits in the intense rivalry of the automotive field, has chosen as his subject, "Planning for Profit," based on his company's formula for "outplanning" competitors. Examining tooling problems and manufacturing feasibility early in the design stages, and preventing or diminishing extravagances in production methods before they are underway, is only the start of the cost-consciousness that pervades successful manufacturing today.

Mr. Davis, in covering the overall profits problem, will perhaps uncover some specific factors underlying such statements as, "No matter how fast you run, you end up in the same place profitwise." His lecture will be delivered at a luncheon Tuesday, May 6. It is second in the series of lectures initiated last year at the 25th Annual Convention and dedicated to the memory of Eli Whitney, sometimes called the father of tool engineering for his concepts of standardization and interchangeability of parts.

Leslie S. Fletcher, ASTE's program director, has announced staunch reinforcement of the '58 theme of "Tooling for Competition" in the technical sessions planned for convention week. Perhaps the most significant contribution to widespread cost cutting will be made by a special 5-session Metal Cutting Seminar. The seminar will review the whole subject of metal cutting, recognizing that the annual bill for producing chips is ten billion dollars, and that industry is not now utilizing all the present knowledge in this field. With a review of metal-cutting techniques, it is possible for some 200 men to take back to their companies knowledge that could result in a minimum improvement of one percent in metal cutting, representing a sizeable contribution. A ten percent improvement by these same men will have made an important impact on the industrial economy of today.

In addition to the seminar, consisting of a series of carefully coordinated papers for which an extra fee is charged, there will be several symposia comprised of a number of papers covering the same general subejct but not necessarily interrelated, for which no additional fee is charged. Among the subjects given symposia treatment are numerical control, tooling for metal powder parts, metal cutting research, and automation for low production.

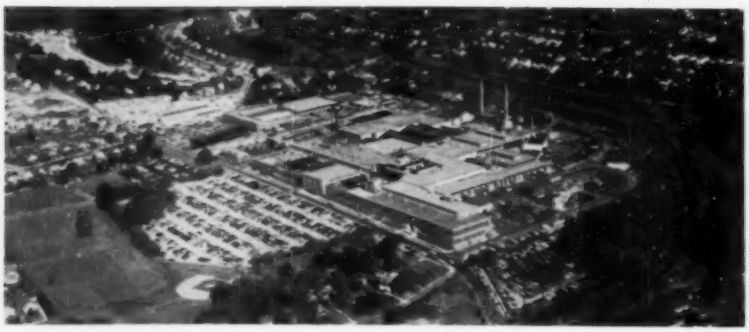
Displays of the latest developments in the production and tool engineering field will await Tool Show visitors, and give them firsthand information on how modern methods and machinery will give them the most for their production dollars. A total of 487 exhibitors will demonstrate their wares in the five great halls of the Philadelphia Convention Center. Registration cards for the Show are now available, and may be procured, together with a complete Show Program, by filling in and submitting the blank found on page 221 of this issue.



Competitive Tooling in Action

Inside Philadelphia's Plants

Inside Philadelphia's Plants



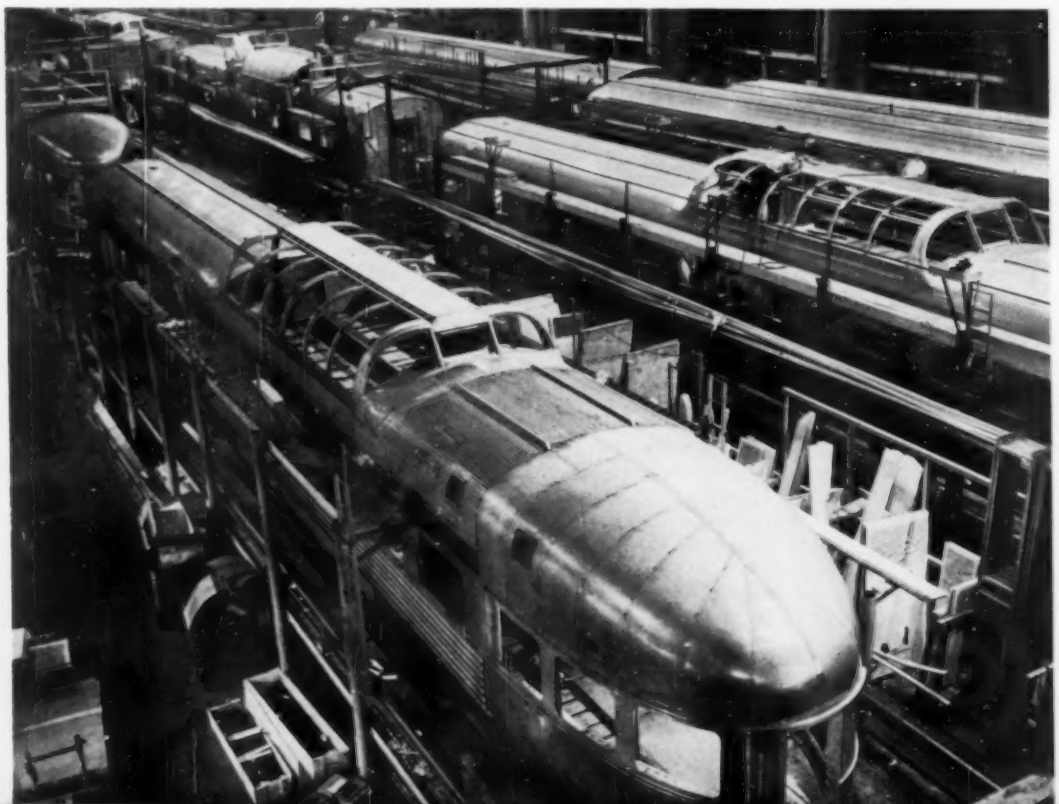
Standard Pressed Steel's suburban Jenkintown plant produces precision fasteners, pressed steel shop equipment and shelving. Latest methods of fabricating screws and threaded parts can be seen.

THIRTY-ONE tours of eighteen different plants in the highly industrialized area whose focal point is Philadelphia will play their part in expanding the theme of the 1958 Tool Show—"Tooling for Competition." Actual on-the-spot contact with manufacturing geared to beat today's stiff competition, and a look at the tooling and tool engineering that backs it up, will be the bonus collected by showgoers who register for one or more of the plant tours listed on the convention program.

The plant names and the products and processes they represent are as impressive as they are diversified. Featured are such well-known names as United States Steel pictured on the preceding page*, Leeds & Northrup, Brown Instruments, Campbell Soup Company, ITE Circuit Breaker, Chrysler-Plymouth, and many others in addition to those depicted on these pages. As the names indicate, the range of operations to be seen is broad enough to include something of interest to those attending.

***At the Fairless Works of United States Steel Corp. near Morrisville, Pennsylvania, coils of steel to be tin-plated are tempered on this two-stand tin plate mill.**

Budd Company's Red Lion Plant produces jet engine components as well as stainless steel railway passenger cars.



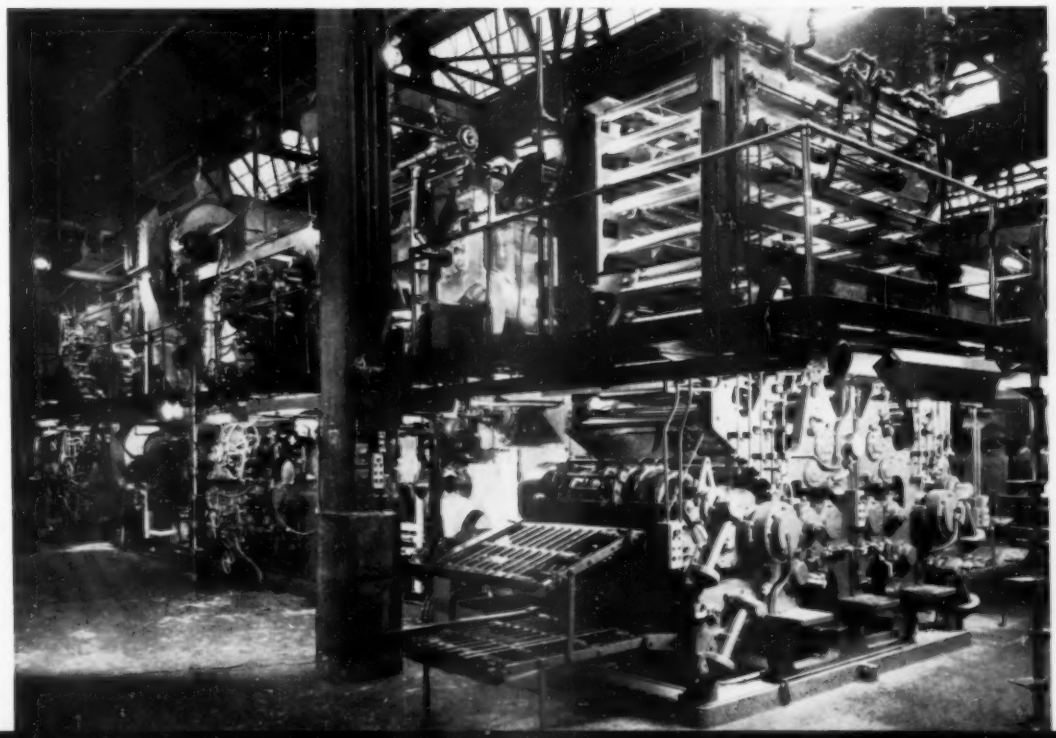


Some mechanized welding and stamping of auto body parts is done at The Budd Co.'s Hunting Park Plant.



Fisher and Porter Company, only twenty years old, is a major supplier of industrial instruments, process control systems, data logging systems and computer control equipment. Since tomorrow's process control systems will be electronic, F&P is conducting an intensive research program in electronics.

Both Cuneo Eastern Press and Curtis Publishing Co. will sponsor tours. Shown here is a giant high speed press.



In the national SPOTLIGHT

Introducing . . . . . ASTE's Two New Directors



Edmund Hollingsworth, president of Tools, Incorporated, has long been active in Philadelphia area activities, having served as chairman of the 1954 ASTE Tool Show in that city. Elected at the 25th Annual Meeting in Houston last March, Mr. Hollingsworth, along with Mr. Ford, was installed as National Director at the semiannual meeting of the Board of Directors in Milwaukee October 31.



Frank F. Ford of Atlanta, Georgia, is owner of Frank F. Ford Associates, a consultant engineering firm there. In addition to local ASTE activities, including a term as chairman of the Atlanta chapter in 1952, Mr. Ford is also a member of ASM, and has served that organization as a delegate and a member of its national nominating committee. He is a Yale graduate and a registered engineer.

New Research Committeeman



Swan E. Bergstrom, executive vice president of the Cincinnati Milling Machine Company, is the most recent addition to the ASTE Research Fund Committee. The selection of Mr. Bergstrom was approved by the Board of Directors at their recent semiannual meeting. A graduate of Purdue University, he has been with the Cincinnati firm since 1927. Intimately associated with the machine tool industry through the years, he served as president of the National Machine Tool Builders' Association (1952-53) and is also a member of the Society of Automotive Engineers, as well as of ASTE. Mr. Bergstrom's public service record includes appointments as Chief Engineer of Armament Production in 1942 and as Director of the Metalworking Division of the National Production Authority, United States Department of Commerce in 1951.

Society Pledges Aid to New Science Chief

Dr. James R. Killian, Jr., newly appointed Special Assistant to the President for Science and Technology, has been offered the "services, facilities, and the fullest cooperation of the Society," for whatever use he might deem helpful in the execution of his new duties.

ASTE's President Harold Collins, in a letter to the new science chief, extended congratulations and best wishes in his new job of marshalling a stepped-up national technology program. He indicated that our Society shares President Eisenhower's confidence in Dr. Killian's capabilities to "precipitate the tremendous resources of our scientists and engineers and to provide the necessary unified guidance of talent and material to its most efficient utilization."

An eminent educator, and president of Massachusetts Institute of Technology, Dr. Killian was among those educational and industrial leaders who spoke at the time of the Silver Anniversary Celebration last March, through the medium of the closed-circuit audio broadcast. At that time he stressed the urgent need for more engineers with a high degree of imagination and insight to keep step with the growing complexity and importance of industrial technology. He recognized at the time the tremendous contributions such technical organizations as ASTE can and do make, in providing a common meeting ground for education and industry and a favorable climate for interchange of ideas between engineers and technologists.

Eastern Contributors to Second Handbook Edition Honored at NTPC Dinner



E. P. Gillane, left, president of Pratt & Whitney, accepts a certificate of appreciation from Frances Sehn, chairman of the National Technical Publications Committees, on behalf of the men in his company and of industry in general that contributed to the second edition of the *Tool Engineers Handbook*.

The National Technical Publications Committee was host to a group of 38 men from the New England Area who have made contributions to the *Tool Engineers Handbook* Second Edition. At the dinner meeting held in Hartford, W. H. Gourlie, a member of the NTPC, officiated as toastmaster. Harry W. Anderson, Hartford chapter chairman, welcomed the group to the city.

Among Society officials and special guests present was Vice President William Moreland, who, after thanking the men for their efforts, pointed out the need for technical books and guidance for young people so they can understand the meaning of engineering and the educational background required to pursue the profession. Also present were E. P. Gillane, president of Pratt & Whitney; Frances J. Sehn, chairman of the National Technical Publications Committee; ASTE Technical Director Frank Wilson; and Assistant Technical Director Philip Harvey.

All the men present were introduced and presented with a personalized certificate of appreciation signed by Chairman Sehn and Harold E. Collins, ASTE's president. Mr. Wilson spoke briefly on proposed books, the information needed, and methods used to assemble the data. He thanked the contributors for their help on behalf of his staff.



North Shore's first chairman, Fred Gripper, right, accepts the baby chapter's "bottle" and best wishes from Marvin Bunting, membership administrator who assisted in the chartering.

NORTH SHORE
becomes newest chapter

Newest of ASTE chapters to join the ranks, North Shore Chapter, Number 146, received its charter Friday, November 8 at Hotel Edison in Lynn, Massachusetts. The event was well attended by some 200 members and guests, who heard key speaker James Low of the National Association of Manufacturers discuss "Leadership in Industry and Community." Mr. Low described human relations in industry so dynamically that his audience gave him a standing ovation at the conclusion of the talk.

Steering the course of the new chapter in its initial year will Fred Gripper, the chapter's chairman; Salvatore Gianino, first vice chairman; Roy Hatch, second vice chairman; Sidney Larkin, secretary; and Charles Sylvain, treasurer. These officers were installed by ASTE's president, Harold E. Collins, who gave those present an interesting insight into what the Society means to tool engineers and industry.

Among the special guests present were Peter Donnelly, president of the Lynn City Council, who extended greetings from Mayor Thomas P. Costin; Frank D. Clark, chairman of Boston chapter, who acted as toastmaster; Past President Joseph Crosby who presented the chairman's pin to Fred Gripper; Floyd McArthur, vice chairman of the National Membership Committee; and Marvin Bunting, staff administrator for membership.



Surprise package for "Rip." President Collins gingerly displays the 10-pound live lobster presented to him by members of the new chapter as Boston Chairman Frank Clark, left, Chairman Gripper, seated, North Shore's Secretary Salvatore Gianino, and others at the head table join in the hilarity.

Board of Directors Candidates Chosen

Meeting at the Detroit Headquarters of ASTE on November 21, the Annual Nominating Committee culminated a year of observation, investigation and record checking in the selection of sixteen men as nominees for the 1958-59 Board of Directors. Chairmanned by Past President Harry B. Osborn, Jr., pictured here, the committee included Carl Oxford, Jr., Joseph L. Petz, Louis Jensen and Roy O. White.

1957 Nominating Committee Report

At the next Annual Meeting of the Society to be held in Philadelphia in May, the House of Delegates will elect fourteen National Directors. The retiring president is the fifteenth member of the Board.

In an effort to provide the Society with the fully qualified Board of Directors to which it is entitled, we have nominated the men presented in this report. Although the constitution provides for automatic nomination of all national officers, we wish to point out that their record justifies such nomination.

Renomination of incumbent Directors and the selection of additional nominees has been based on their executive ability and past performance in the various Society Activities in which they have been involved.

Respectfully submitted,
The 1957 Nominating Committee



Harry B. Osborn, Jr.
Chairman



Harold E. Collins, who will be the retiring president at the time the new Board is chosen, automatically becomes its fifteenth member, as prescribed by the ASTE's Constitution.

CANDIDATES

Wilfred Pender
Bruce Fairgrieve
George A. Goodwin
Wayne Ewing
Frances J. Sohn
Robert E. McKee
H. Dale Long
William Moreland
John X. Ryneska
David A. Schrom
G. Ben Berlien
Irving H. Buck
Frank F. Ford
Philip Marsilius
Joseph L. Petz
Leslie C. Seager

1958 CANDIDATES chosen



H. Dale Long, third vice president and currently in his third term as a national director, has in the past served in the capacity of national treasurer and fourth vice president. He has also been a member of the Annual Nominating Committee, and has headed up the National Finance Committee as its chairman. Mr. Long, president of Scully-Jones & Company, Chicago, has held various offices in the Chicago chapter, culminating in its chairmanship. He acted as co-host chairman of the 1952 Tool Show, at the same time serving as chairman of the House of Delegates. Mr. Long is also affiliated with the American Management Association, and is currently a member of the Planning Council of its Research and Development Division, having served as chairman of a number of its seminars.



George A. Goodwin, first vice president, now serving his eighth term as a national director, is works manager of The Master Electric Company, Dayton, Ohio, a Division of Reliance Electric & Engineering Company. Three times treasurer of the Society, he was prior to that a member and past chairman of the National Finance Committee. He has served both as chairman and vice chairman for his chapter, Dayton, of which he was a charter member. A registered professional engineer, Mr. Goodwin has held various engineering positions since 1910, and is a member of the Advisory Committee on Tool Engineering at Sinclair College.



John X. Ryneska, currently national treasurer of ASTE and a director for the second time, is also a member of the National Finance Committee. His national record includes membership on the National Policy Coordinating Committee, Progress Committee, Membership Review Committee and Annual Nominating Committee. In addition he has held the offices of secretary of the Society and chairman of the National Constitution and Bylaws Committee. Mr. Ryneska is past chairman of Boston chapter and was general chairman of the 1946 semiannual meeting. He is purchasing manager for the General Plant Utilities Section of the Medium Steam Turbine, Generator & Gear Dept., General Electric Co., Lynn, Mass. He is affiliated with the National Society of Professional Engineers and its Massachusetts counterpart and with the National Purchasing Agents Association.



Joseph L. Petz, currently serving his second term on the board of directors, acts as secretary-treasurer of Petz-Emery, Incorporated, and of the J. L. Petz Company, both in Pleasant Valley, New York. He has spent seven terms on the National Editorial Committee, with three terms as chairman of that group to his credit. He has served the Mid-Hudson chapter as chairman and in many other capacities. Mr. Petz has taught tool design, as an outside activity, to IBM apprentices and enrollees in that company's general education evening classes for many years, and is affiliated with the American Society for Metals.



Leslie C. Seager, presently serving as a national director, has also served five terms on the National Professional Engineering Committee, including one as its chairman. He is chief production engineer with Eimco Corporation, Salt Lake City, and charter chairman of that city's ASTE chapter. Currently a part-time faculty member of Westminster College in Salt Lake City, Mr. Seager helped to establish four-year tool engineering curricula at both Utah State College and Westminster. This latter school's curriculum is now fully accredited, due to Mr. Seager's work on the Accreditation Committee. As president of Utah Engineering Council, he has long worked toward upgrading his state's registration law and permitting registration in tool engineering. He belongs to the American Ordnance Association and England's Institute of Production Engineers.



Robert E. McKee, now in his fourth term on the National Education Committee, served as its chairman for three years, as well as chairman of the special Grade-Member Committee in 1955-56 and as a member of the Name-Change Committee the following year. Fourteen years of teaching and research experience at the University of Michigan, led to his present position as training director of the R. K. LeBlond Machine Tool Company of Cincinnati. In addition to ASTE, Mr. McKee holds membership in the American Society of Engineering Education, ASME, on whose Metal Processing Committee he is now serving, and NMTBA. He has presented many papers, published numerous articles, and spoken extensively on the subjects of metal cutting, machinability and education.



David A. Schrom, currently secretary of the Society, has served on the National Editorial Committee two terms, on the National Public Relations Committee as its vice chairman and on the National Technical Publications Committee two years, one as its vice chairman. Active in the Central Pennsylvania chapter, he has been chairman of the chapter's program, education, editorial, professional engineering and technical publications committees, as well as chapter chairman. A graduate of Pennsylvania State University in industrial engineering, Mr. Schrom has taught evening classes at the YMCA and has done considerable public speaking.



William Moreland, at present fourth vice president of ASTE, has served two terms as national director and one term as national secretary. A past chairman of Rockford chapter, he is now affiliated with the Mansfield, Ohio chapter, and is vice president in charge of manufacturing of the F. E. Myers & Brothers Company, Ashland, Ohio. He has been both chairman and vice chairman of the National Standards Committee, on which he served for ten years. He has also served on the Name-Change Committee, the Annual Nominating Committee, Progress Committee, and the Policy Coordinating Committee. Mr. Moreland is the ASTE alternate on ASA's Mechanical Standards Board, a member of the Research Institute of America, the American Management Association and other management groups, and he is also associated with Ashland's Chamber of Commerce.



Irving H. Buck, an incumbent national director, is president of the Tool Supply and Engineering Company, Dallas. He has served four terms on the National Membership Committee, and, as area captain, was instrumental in the chartering of many new chapters in the Southwest. A charter member of the North Texas chapter, Mr. Buck has held many chapter offices, including the chairmanship for three terms. He belongs to the Engineers Club of Dallas, the Chamber of Commerce, and is a member of the board of directors of the Great Southwest Life Insurance Company. He is also on the Greater Dallas Club's board and is its secretary-treasurer.



Wayne Ewing, second vice president of ASTE and now serving on its board of directors, has also held the offices of secretary, fourth and third vice president. A one-time member of the National Education Committee, he has also been vice chairman of the National Membership Committee. He has served the Los Angeles chapter in the capacities of chapter chairman, second and first vice chairman, and national delegate for two years. Mr. Ewing is president of the Arrowsmith Tool and Die Co., Los Angeles, California. A member of the Society of Automotive Engineers and of both the Southern California and the National Tool & Die Association, he has been active on county and state committees for the education of apprentices in tool engineering and tool and die making.

1958 CANDIDATES chosen



Frances J. Sehn, chairman of the National Technical Publications Committee since 1952, has also served both on the Annual Nominating Committee and the National Standards Committee. He represents ASTE on the Pressed Metal Institute's Honor Award Committee, and is a member of the American Standards Association's B-32 Sectional Committee on Sheet Metal and Wire Standards. Mr. Sehn is owner of the Fran Sehn Company, Detroit, consultant engineering firm affiliated with Press Automation Systems. He received his technical training at Wayne State University and Lawrence Institute. He is a registered professional engineer.



Gustave (Ben) Berlien, an incumbent national director, is a partner in Industrial Steel Treating Company of Oakland, California. He was a member of the 1953 Annual Nominating Committee, and a member of the National Editorial Committee three years, including one as its chairman. His many chapter offices include that of chairman. Mr. Berlien has lectured widely for ASTE and ASM chapters, and has contributed numerous technical articles to metalworking publications. He is affiliated with ASM, Metal Treating Institute, and the American Society of Refrigerating Engineers.



Bruce Fairgrieve, vice president of Fairgrieve & Son Limited, has served on the National Finance Committee one term, and is currently a member of the National Public Relations Committee. A member of the Toronto chapter, he has spent two terms as chapter editorial chairman, two as treasurer, and one term as third and second vice chairman, chapter chairman and national delegate. Mr. Fairgrieve is a graduate of the Western Technical and Vocational School and Shaw's Business College, both in Toronto. He has also served his apprenticeship as a tool and die maker, and completed the R.C.A.F. War Emergency course.



Wilfred J. Pender, vice president and factory manager of Potter and Johnston Company, has been a member of ASTE since 1944, when he joined the Little Rhody chapter. He was appointed chairman of the chapter's public relations committee the same year, and in quick succession became secretary, first vice chairman and finally chairman of his chapter. Since then he has acted as chairman of the nominating committee for five years, chairman of the education committee for one year, and has spent four years as a member of the constitution and bylaws committee. He is currently a member of the National Constitution and Bylaws Committee. Mr. Pender received his technical training at the Rhode Island School of Design and completed a course in the International Correspondence School. He has been with Potter and Johnston since 1923.



Philip R. Marsilius, a past chairman of the National Program Committee, and currently serving on the board of directors, is executive vice president of the Producto Machine Company, Bridgeport, Connecticut and president of the Producto Corporation, Detroit. A past chairman of Fairfield County chapter, Mr. Marsilius has held the post of government specialist for the tool and die industry, with the National Production Authority, Department of Commerce, Washington. He is a past president of the Southern Connecticut Tool & Die Manufacturers Association, and is now president and a director of the National Tool and Die Manufacturers Association. Active in civic groups, he holds a B.S. degree from Norwich University and an M.S. from MIT.



Frank F. Ford, a newcomer to the board of directors installed in October of last year, is owner of Frank F. Ford and Associates, a consultant metallurgical and production engineering firm in Atlanta, Georgia. Active in ASTE activities in the Atlanta chapter, he served as its chairman in 1952. He is a registered professional engineer belonging to both the Georgia and the National Society of Professional Engineers. A Yale University graduate in metallurgy, Mr. Ford has been associate professor of chemical engineering at Georgia Tech. In addition to affiliations with the Georgia Engineering Society and the American Welding Society, he is a member of ASM, and has served that group as delegate and national nominating committeeman. He was also a conferee to the First World Metallurgical Conference in Detroit, in 1951.



E. J. Baumrucker



George C. Johnson

members on the MOVE

Rehnberg-Jacobson Manufacturing Company at Rockford, Illinois, has announced the appointment of **George C. Johnson** as president and general manager. Mr. Johnson comes to the company after thirty years in various supervisory capacities at another well-known Rockford machine tool manufacturer. Future plans at Rehnberg-Jacobson, under Johnson's direction, include expansion of present lines into larger production machines and various forms of "transfer" machinery.

Edwin S. Phillips, national delegate of Pittsburgh chapter, has recently become a member of the National Standards Committee. He is president and owner of his own business, E. S. Phillips Company, tool and machinery distributor.

Stephen B. Fuerst has been appointed consultant for manufacturing engineering research, General Electric Company's manufacturing services.

David E. Laughlin, Fond du Lac, has been appointed manager of the Digimatic (a tape-controlled system for machine tools) Marketing Section of Electronic Control Systems, Incorporated, Los Angeles.

Bernard R. Better, chairman of Professional Engineering Committee, Chicago, has recently become Registered Professional Engineer. Mr. Better is Director of Research for Scully-Jones.

George A. Baird, Peterborough, has been appointed to the new post of associate director of engineering, Burroughs Corporation.

Fred J. Schmitt, Chicago, past national director of ASTE, has been appointed vice president of the D. A. Stuart Oil Company, Ltd., Toronto.

Ervin J. Baumrucker, Detroit, has been promoted from general sales manager to vice president in charge of Domestic Press Sales for Clearing Machine Corporation, a division of United States Industries, Inc.

Philip R. Marsilius, Fairfield County, and **Harold G. Murdock,** Los Angeles, have been elected to the offices of president and second vice president, respectively, of the National Tool and Die Manufacturers' Association at that organization's 12th Annual Convention, October 30-November 3, 1957.

Raymond J. Zale, Pittsburgh, has been appointed general sales manager, Vulcan Crucible Steel Division, H. K. Porter Company, Incorporated.

Herbert A. Potter, Rochester, has been appointed Rochester sales manager for the Taft Peirce Manufacturing Company, Woonsocket, Rhode Island.

Julian S. Natanson, Boston, has been appointed to the faculty of the Lincoln Institute at Northeastern University. He is also conducting a recently instituted "Work Simplification" program at the Keystone Camera Company, Boston, where he is employed as a member of the Industrial Engineering Staff.

Gene Helfer, past chairman of Western Reserve, is now with Metal Carbides, Youngstown, Ohio, as methods engineer.

Darwin W. Clay, Schuylkill Valley, was elected to the post of second vice president at the Annual Meeting of the Pressed Metal Institute, held October 13-17 at Castle Harbor Hotel in Bermuda. **C. R. Boeckler,** Buffalo; **James A. Leake,** Toledo; **Walter S. Sutowski,** Cleveland; and **P. C. Wood,** Toledo were elected to the Board of Directors.

Glen R. Fitzgerald, Detroit, has been named to succeed Martin J. Caserio as director of engineering and equipment sales for the Flint plants of AC Spark Plug Division, General Motors.

The National Machine Tool Builders' Association has elected **Ralph J. Kraut,** Fond du Lac, first vice president at its 56th Annual Meeting held at French Lick, Indiana; **Walter K. Bailey,** Cleveland, was re-elected secretary.

Howard Jamison, Detroit, and **William Brick** have resigned their positions in sales for The Motch and Merryweather Machinery Company to form the Nu-Tool Sales Company. Among other lines they will carry are sawing machines and segmented saw blades, collets and stud setters, boring bars and floating toolholders.

E. B. Jones, San Gabriel Valley, who has been connected with the grinding industry for the past 18 years, has been appointed sales manager of Eason Grinding Company, Los Angeles.

Joseph S. Jonkey, Los Angeles, has joined Consolidated Electrodynamics Corporation as production manager of the Glendale Division. He was formerly manager of product engineering at Wm. R. Whittaker Company of Hollywood.

J. W. Ripple, Buffalo-Niagara Frontier, has been assigned to the post of production manager to serve in liaison capacity between the manufacturing departments and the field sales force of The Carborundum Company.

Announcement has been made of the appointment of **Jay E. Watson,** Philadelphia, as chief engineer in charge of conventional gages, at the Pratt & Whitney Company's Gage Division. He is an authority on gages, measuring devices, and inspection standardization for military and industrial operations both here and abroad.

J. James Brown, Long Island, has been transferred from the Eastern territory of Morse Twist Drill and Machine Company to Chicago as Midwest District manager.

Norton Company has appointed **W. Alexander McCune,** Hamilton, to the newly created position of manager of field sales. For the past four years Mr. McCune has acted as general sales manager of Norton Co. of Canada, Ltd.

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chapter news and views

Emanuel Lull Speaks To New Haven Members

A social hour and buffet supper, through the courtesy of Crucible Steel Company at the New Haven warehouse Novmber 7, was followed by a presentation by Emanuel E. Lull, assistant manager of Tool Steel Sales Division of Crucible Steel Company, of "A Toolmaker's Omnibus." Mr. Lull is vice chairman of the ASTE National Membership Committee and past chairman of New Haven chapter.

After discussing the behavior of steels during different rates of heating and cooling, the speaker emphasized the importance of stress relief and rough machining before final heat-treating to minimize the cost of difficult finishing operations on parts of high hardness.

Northern Massachusetts Panel Discussion

A panel composed of John N. Engelsted, president of O. S. Walker Company; Robert S. Harper, vice president and general manager, Greenfield Tap & Die Corporation; Arthur H. Starrett, president of L. S. Starrett Company; Ernest Schlensener, vice president of manufacturing, Rodney Hunt Machine Company; John J. Owen, executive assistant to president, Millers Falls Tool Company; George E. Grover, vice president and works manager, Union Twist Drill Company; and special guests, was the main feature at the November 19 technical meeting at the Weldon Hotel.

Two hundred fifty members heard the discussion entitled "What You Can Do To Gain Recognition from Your Management."

Irwin A. Holland, past president of ASTE was special guest for the occasion.

Muskegon Holds Student Industry Day



MUSKEGON—Student Industry Day was the occasion for some 300 students from Muskegon area high schools to tour local industries and learn firsthand what a career in engineering would encompass. The group here is visiting Manning, Maxwell & Moore small plant.

Some three hundred students who had voiced their desire to take up some form of engineering as a career were selected to participate in Muskegon's highly successful Student Industry Day. The senior youths were selected from four high schools in the Muskegon area and from Community College of Muskegon.

The day's program started at 8 a.m. when students, speakers, and sponsoring ASTE members met at Muskegon Heights High School auditorium for welcoming addresses and a general session, after which the students were dispersed to various plants in and near Muskegon, where they were given the opportunity to discuss in more detail the various phases of engineering.

During the afternoon sessions, the students were given a conducted tour of the plant, plus plenty of opportunity to ask questions and to see the various manufacturing processes. The entire program, which was planned by the chapters' two education committee chairmen, Jack Jilek and Edward Huttenga, was met with a great deal of enthusiasm by school personnel, students, and local industrial managements. Participating plants included Johnson Products Company, Muskegon Piston Ring, Consumers Power, Norge Corporation, Bennet Pumps Division of John Wood Manufacturing Company, Sealed Power Corporation, Morton Manufacturing Company and Misco Precision Castings Company. Others were Clarke Sanding Machine Company, Michigan Spring Company, Economy Tool & Machine Company, American Coil Spring, E. H. Sheldon Company, Continental Motors, Brunswick-Balke-Collender Company, Campbell, Wyant & Cannon Company, S. D. Warren Paper Company, Manning, Maxwell & Moore, and Anaconda Wire & Cable. —*D. G. Fredricksen*

Chapter news and views



DETROIT—Shown at the Education Meeting November 21, are, seated, left to right: S. Casson, general sales manager, Detroit area; H. F. Fussner, sales manager of Threading Division; and M. Barden, assistant superintendent of Michigan Tool Division, all of National Acme Company. Standing, left to right, are B. Greenwood, education chairman; E. Novack, chairman; B. Wallis, second vice chairman, all of the ASTE Detroit chapter, and W. Hunter of National Acme Company.

Investment Casting Is Worcester Subject

"Better and Cheaper Mousetraps" was the interest-rousing title of a talk by Harry I. Dixon, president of Metallurgical Products Corporation, at Worcester's recent technical meeting. It referred to a specific job application for investment casting that Mr. Dixon faced when asked to produce a number of small figures of a mouse as a novelty item.

The talk explained procedures used in both the "lost-wax" and frozen mercury processes, as well as the shell mold and plaster mold methods of casting. The lost-wax method, Mr. Dixon revealed, was well-named, since the wax patterns with their investment shell around them are heated in a moderate oven, causing the wax to melt out, and effecting changes which make it unusable as a pattern again. In the "Mercast" method, frozen mercury cooled to a temperature of –100 F, is used for the pattern. It can be reclaimed and reused by flushing it out of the shell with a stream of warm mercury.

Tolerances from three to five thousandths and finishes from 124 to 36 microinches can be achieved by these two methods, which also lend themselves to producing intricate shapes and coring. In shell and plaster mold casting methods the finish and tolerance are not as close, but there are still many advantages in them, Mr. Dixon stated. He showed excellent slides. —*R. A. Casson*

Santa Clara Learns Evolution of the Lathe

At the November 19 meeting at Babbitt's Copper Skillet, "Evolution of the Lathe" was the subject presented by A. R. Burke, assistant to the sales manager, Lathe Division of Axelson Manufacturing Company, which is a division of U. S. Industries, Inc. Mr. Burke gave a complete history of the origin and development of the lathe from its earliest use by ancient carpenters to the present day. He explained that the word lathe originated from "lath", saying that some of the first lathes were powered by a springy lath mounted to the ceiling.

Membership pins were awarded to Ned R. Powley and Stanley Smith.



SANTA CLARA VALLEY — Chairman L. H. Cook, right, congratulates A. R. Burke, who spoke recently on "Evolution of the Lathe." —*Dresden Smith*

Detroit Chapter Sections Have Diversified Programs

Detroit Chapter's Education Section met on November 21 to hear H. F. Fussner, sales manager of Threading Division, and M. Barden, assistant superintendent of Machine Tool Division, of the National Acme Company, speak on "Modern Tooling for Automatic Screw Machines." Mr. Fussner discussed the basic and complex aspects of screw machine tool designing and demonstrated various examples of good and poor methods, describing various tooling for threading applications. Mr. Barden spoke on the subject of tooling bar machines with carbide and discussed actual case histories and the troubles that have been encountered.

A panel symposium on ceramic tooling was arranged by Detroit's Carbide Program Chairman Ross Kogel for November 7. Panelists were George Squibb, G. M. Tech. Center; Philip D. Arnold, Oldsmobile Division; O. A. Schmidt, Kearney & Trecker Corporation; Steve Cowell, Ford Motor Company; and Edward Kibbett, Stupalox Division of Carborundum Company.

Members of the chapter also participated in an Engineering and Science Vocational Guidance Conference held at the Engineering Society of Detroit in November. Of the 850 high school students who attended the conference, 25 percent of them received counseling by ASTE members. Society brochures explaining "Career Opportunities in Tool Engineering" were distributed at the meeting, in which other technical societies participated. —*J. W. Wrobel*

Panel Discussion At Hamilton District

On November 8, the regular 149th monthly dinner meeting was held at Brant Hotel with 63 members present. Panel discussion and a film were presented by Automotive Parts Manufacturers Association (Canada), Die Casting section, and a film on this subject was entitled "The Shortest Way." The panel experts were: Moderator J. S. Bulmer, Dominion Die Casting, Ltd., N. J. Clark and Ralph Roediger, manager and sales engineer, respectively, of the Barber Die Casting, Ltd.; Peter Draycott, sales engineer, Canadian Steel Improvement, Ltd.; Peter Findlay, Consolidated Mining and Smelting Company of Canada.

The chapter's annual fall dance was held November 15 at the Royal Hamilton Yacht Club with 74 couples in attendance. Winners of the door prizes were Mrs. Ken Fletcher and Bill Richardson. —*Russ Wilson*

Baltimore Adopts New Public Relations Program

ASTE's Baltimore chapter has instigated a new program in public relations, designed to acquaint more Baltimore industries with the Society's activities, and the benefits to be gained from them. The program is divided into three parts and includes: (1) invitations to tool managers and superintendents to attend the regular monthly technical meetings of the chapter as guest of honor for the evening; (2) a direct mail campaign—letters to local company officials describing ASTE to them, inviting inquiries on membership, and extending invitations for the next meeting; and (3) a new campaign directed toward the acquisition of new companies as affiliate members, using direct mail and telephone.

In carrying out this program, the chapter invited Adolph Vlcek, Jr., tool manager of The Martin Company, as the chapter's first honor guest.



ROCKFORD—Program Chairman Les Teachout from left, Larry Geiger, secretary, and Frank Mertz, right, tool engineer with Greenfield Tap and Die Corporation, look on while Glen H. Stimson, sales manager and chief engineer of the same company, brings out the point of correct gages for checking equipment in his speech, "Gages, Watchdogs or Bandits." —*Kenneth R. Bookland*

New Jersey Ford Plant Seen by Hendrick Hudson

Joining members of Hendrick Hudson chapter at a recent plant tour were representatives from the American Management Association, members of ASTE's Schenectady chapter and student representatives of the Hudson Valley Technical Institute. They visited the new Mahwah, New Jersey plant of the Ford Motor Company, largest assembly plant in the world, employing 5800 people. Gerald W. Scheffler and Howard W. Bancroft of the Green Island plant arranged the tour under the direction of Harry R. J. Osterberg, chairman of the committee for arrangements.



LONG ISLAND—Pictured is the nominating committee for 1958: from left, Chairman Ted Borecki, George McLaughlin, past chairman and National Standards Committeeman, and John Hatter, past chairman and National Editorial Committeeman. —*John M. Miller*

Jerry Tipton Speaks On Automation at Birmingham

At the technical dinner meeting held October 17, at Thomas Jefferson Hotel, 49 members heard Jerry Tipton, chief engineer, of the Denison Engineering Division, American Brake Shoe Company, speak on "Automation via the Hydraulic Press." Mr. Tipton's presentation was accompanied by three timely movies, which were followed by a discussion period. The first movie showed hydraulic processes on the job in five basic divisions of manufacturing; the second showed on-the-job production scenes of high-speed and multiple stage blanking and forming operations; while the third covered the use and design of hydraulic indexing tables. Sample parts manufactured on hydraulic presses were passed out to the group for inspection and a small operating hydraulic press was on display. —*J. E. Wilkinson*



SPRINGFIELD, ILL.—C. G. Schelly, director of Wilkie Foundation, The DoAll Company, explains the evolution of gage blocks to, from left: Chairman Ross McNutt, Robert Woods, program chairman; and Vice Chairman Forest Hodge. —*O. A. Steen, Jr.*

M. F. Judkins Addresses Benton Harbor-St. Joseph

On November 14, Malcolm F. Judkins, director, New Product Development, Firth-Sterling, Incorporated, addressed the Benton Harbor-St. Joseph chapter. He described the special problems and materials that required solution and development before economic domestic nuclear power can become a reality. Mr. Judkins briefly discussed nuclear physics and gave a summary of the types of power reactors, both presently operating and under consideration, and touched on the economics of nuclear power in this country and abroad.

Chapter news and views



WICHITA—Chairman Paul Hess, right, presents to Bill Unruh at the October meeting, the service award for outstanding contribution to the chapter throughout the past year. —*W. I. Chambers*

Springfield, Massachusetts Learns of Nuclear Energy

Eighty-two members attended the technical meeting held November 18 at the Wayside Inn to hear William B. Allred, manager, Engineering Laboratory of Combustion Engineering. Incorporated, speak on "Nuclear Engineering," beginning with the discovery of fission processes by German scientists in 1939 and bringing it up to the present-day reactors to develop power. Some of the highlights were that the field of nuclear engineering, in existence only fifteen years an an industry, has a great need of exchange knowledge and, since there is no handbook to refer to, problems must be solved in laboratories.

—*Edward F. Organek*



WORCESTER—John C. Baker, left, chairman of Worcester's Society of Carbide Engineers, which met jointly with the local ASTE chapter, poses with Speaker Jerome F. Kuzmick, center, and C. Lalor, Worcester chapter. Unique carbide applications and processes were discussed at the meeting.—*Robert A. Cusson*

Western Wives Form Women's Group "ASTEtts"

In October the kickoff meeting for an area-wide organization planned for the wives of ASTE members was held. The first all-woman meeting was held November 8 at Michaels Restaurant, the halfway point for all Southern California chapters. Seventy-four women declared as their purpose: (1) aiding the chapters in their social activities; (2) planning ladies' activities during the ASTE western tool shows; and (3) undertaking activities of their own.

The group, which is called "ASTEtts," will hold four meetings a year and is dedicated to promote intra, as well as inter-chapter social activities on an area-wide (rather than chapter) level and to refrain from interference or competition with ASTE chapters. The ASTEtts will hold their first meeting since organization in February.

—*Peggy Edgecomb*



WENTWORTH INSTITUTE—Student Gerald Portyrata, left, receives congratulations from President H. Russell Beatty upon reception of scolarship presented by the Boston chapter of ASTE.

Two Newly Named Editors R. W. Reinhardt, M. L. Stone Join *Tool Engineer* Staff

Two new appointments to the editorial staff of THE TOOL ENGINEER have been announced by John W. Greve, editor of the magazine. M. L. (Mel) Stone has been named news editor, replacing Janet Lofting who resigned recently, due to a change of location; and Robert W. Reinhardt, formerly associate editor for the technical publications department staff, has been appointed assistant editor on the technical staff of the magazine.

Mr. Stone comes to THE TOOL ENGINEER news department from *The Detroit News*, where he has been employed as copy editor for the past three years. Prior to that, he had gained experience as copy editor for the *Louisville Courier-Journal* in Kentucky and as reporter, make-up man and news editor for the



R. W. Reinhardt



M. L. Stone

Little Rock Gazette in Arkansas. He holds a master's degree from Cornell in addition to a B.A. from the University of Oklahoma. Mr. Stone will be assisted by Suzanne Olson, recently named associate news editor, in recognition of her work in news coverage and feature article writing.

Mr. Reinhardt, a former quality standards specialist with Mercury Division of the Ford Motor Company, has been on the technical publications staff since April, 1956, where he has been responsible for the Handbook of Process Planning and Estimating. He has also been assisting in the editing of the revised edition of the Tool Engineers Handbook.

Mr. Reinhardt holds a B.S. degree in mechanical engineering from the University of Detroit and an M.S. in industrial engineering from Wayne University. He has been an active member of the Detroit chapter of ASTE, and also belongs to ASME & SAE.

Other changes on the magazine's editorial staff include the appointment of Theodore Black as senior associate editor and Virginia Kuczynski as editorial assistant in charge of production.

Erie Program Features Industry and Education

At Erie's second annual Industry and Education Night, 70 members heard John M. Hickey, superintendent of Erie schools, and Edmund Hollingsworth, of the National Board of Directors. Following a steak dinner, Dr. Hickey gave a short talk on "Education in Erie," supplemented with a color sound movie. This was followed by Mr. Hollingsworth's talk on what ASTE is doing to promote a better understanding between our educational and industrial institutions. An interesting question period ensued. —*Leo B. Weiner*

Former Texas Governor Highlights Houston Meet

"Engineering the Tools of Democracy" was the title of the talk delivered by Allan Shivers, former governor of the state of Texas, at Houston's Annual Industry and Education Night November 12. An audience of 220, including 45 of the top executives representing local industry and educational institutions, heard Mr. Shivers rap the two major political parties for their continual catering to minority groups, and predict that as a result of this catering there would emerge a strong third party movement.

Mr. Shivers was introduced by Charles H. Elliott, vice president of Reed Roller Bit Company. Houston Chairman Charles Langdale presided at the meeting. —*A. G. T. Kane*

Hydrospin Process Explained at St. Louis

Ninety members attended the dinner and technical meeting at the Kingsway Hotel November 7, where they heard John McCormack, field engineer, Process Machinery Division of the Cincinnati Milling and Grinding Machines, Incorporated, speak on "Designing for the Hydrospin Process," demonstrating and explaining the process with slides.

First Vice Chairman C. A. Brown presented memento awards to: Jim Wilson, Henry Kraus, Ernie Nieman and Fred Sachleben for their outstanding work in presenting data for ASTE handbooks.

A previous meeting designated as Suppliers' Night drew some 300 people. Over forty well-planned exhibits were displayed showing the latest in tools, grinding wheels, cutters, drills and supplies for 1957-58. Many experienced tool engineers were on hand to explain the exhibit and answer questions.

—*William A. Russell*



MUNCIE—Chairman Emmett Blocher, left, shakes hands with Ray J. Stanish, manager of central staff placement, Thompson Products, Inc., speaker at the November 5 meeting, as Toastmaster Carl Darger looks on. —*John Scheerer*



LITTLE RHODY—Speaker E. E. Lull's audience appears engrossed in his subject of the phenomena of steel behavior in the fabrication of metal products at a recent technical meeting. Mr. Lull of Crucible Steel stressed the working, processing and maintenance of tools and tool steels. Colored slides illustrated his talk.

—*Harold B. Nihill*



CALUMET AREA—Edward J. Vennon, sales engineer, Blaw-Knox Company, left, and H. F. Aldrine and John Hennes, machine-shop foremen with the same company, are discussing E. S. Rider's "Trends in Modern Forging." —*John R. Albrecht*

chips and chatter

Calumet Area

The first annual dinner dance was combined with Ladies Night December 14 at the Lincolnshire Country Club, Crete, Illinois, with music by Henri Buttell and his orchestra.

E. S. Rider, Chicago District representative of the National Machinery Company, spoke to 83 members at the October meeting held at Phil Smidt's Restaurant. Mr. Rider's talk and film entitled "Trends in Modern Forging," was an up-to-the-minute presentation of modern forging trends and the complex machines and machine operations involved. An active question and answer period followed the talk.

Professor C. H. Zacker, chairman of the Educational and Professional Engineers Committee, explained the fall preparation program for Professional Engineers at Purdue Extension.

Canton

C. R. Stroupe, vice president of Anocut Engineering Company, was the speaker at the November 21 meeting held at the Swiss Country Club. Mr. Stroupe's talk, "Electrolytic Grinding," was accompanied by slides. After the technical session, members and guests were taken to the Manchester Machine & Tool Company to see the actual operation of Anocut equipment.

Greater New York

The highlight of the December 2 meeting in the Terrace Room of Hotel New Yorker was a talk entitled "Preparation of Tolerance and Process Charts" by Louis Schoen, chief of engineering processes, Bendix Aviation Corporation. A large number of members participated in the question and answer period and, through courtesy of Mr. Schoen's brother Julius, members were able to procure samples of the large tolerance and process charts.

Chautauqua-Warren

An interesting presentation on Autometrology — automatic measurement and assembly—was given by J. D. Connell, project engineer of The Sheffield Corporation at the October meeting held at Hilltop Hall in Jamestown.

Coffee speaker Gordon Elliot of Microline, Inc. presented a survey of the limitations in the field of linear and circular measurement and discussed the application of precision graduated scales in order to overcome these limitations.

Buffalo-Niagara

"Metal in Motion" was the title of a talk given by Mark Ziegler, assistant production manager, Impact Extrusions, Aluminum Company of America, at the November 14 meeting held at Buffalo Trap and Field Club. The talk was accompanied by colored slides, showing some of the technical problems involved in impact extrusion. Numerous samples of various shapes and sizes of parts produced by this process were displayed.

Hartford

At the December 2 meeting at The Hedges, members and guests heard Theodore G. Clement of Eastman Kodak Company tell "The Kodak Design Story," a history of product development and design, with particular regard to investigations in manufacturing fabrications, methods, tooling and other means to determine production estimates and design policy.

Indianapolis

The 40 & 8 Chateau was the scene of the November 7 meeting, where Robert L. Kessler, manufacturing engineer, Delco-Remy, spoke on "New Frontiers."

Grand River Valley

The Engineering Institute acted as host when they combined with Grand River Valley chapter and Canadian Welding Society on December 12. "Application of Incentive in Industry, Better Known as Profit Sharing," was the title of a talk presented by M. M. Vuchnich, president of Lincoln Electric.

Little Rock

At the November 14 meeting held at Hank's Dog House, Don Small of Teletype Corporation conducted a general discussion on industry moving south.

Cedar Rapids

"Swiss Automatic vs. American" was the topic discussed at the November 14 meeting at the Sheraton Montrose by William C. Bennett of Carl Hirschmann Company, Inc. Social hour and discussion by members followed.



ERIE—Vice Chairman Samuel A. Fiorenzo presents the grand prize to Mr. and Mrs. John S. Zeppenfeld at the 11th annual Ladies Night, while Vice Chairman Richard A. Banaszek looks on.



BINGHAMTON—W. S. Holloway, speaker at November 6 meeting, is flanked by John Maruca, program chairman, left, and Chairman Andrew Komar.

Lansing

Seventy members attended the technical meeting held November 11 at the Civic Center, where Stanley R. Cope, president, Acme School of Die Design, explained by slide illustrations a number of actual case histories and problems in design, building and trying out of dies. A question and answer session followed with actual samples of some of the case histories shown by slides.

Hamilton District

E. W. Dickett, Sundstrand Machine Tool Company, who has toured all the Canadian ASTE chapters, talking at each one over a three-week period, spoke at Hamilton District October 11, at Fischer's Hotel, with 58 present. The program was entitled "Machine Tools for the Tool Engineer" and included a 60-minute sound film. The film and Mr. Dickett's talk outlined ways of adapting standard machine tools for production purposes. Colored slides were shown by Sam Johnston, chairman of the entertainment committee.

Six new members were presented ASTE pins by Chairman Harry Ward, who also presented Archie Corkigian with the award he won in the recent national gadgets contest.

Muncie

Annual Executive Night, November 5, at the Empire Room, Delaware Hotel, brought 120 members and guests, who heard Ray J. Stanish, manager Central Staff Placement, Thompson Products, Inc., speak on "Atomic Energy—Pleasant Style." Mr. Stanish, with a BS degree in physics and mechanical engineering and MS degree in engineering mechanics, all from Case Institute of Technology, served as an instructor on the faculty at Case. He had been with Thompson Products for five years in the capacity of development engineer and chief engineer of the replacement division before being named to his present office.

Chicago

At Nielsen's Restaurant November 11, 115 members and guests heard Warren J. McGonnagle, associate physicist, Argonne National Laboratory, speak on "Atoms' Use in Industry." Mr. McGonnagle, with A.B., M.S. and Ph.D. degrees, besides teaching physics at Western Michigan College and University of Oklahoma, has worked as junior physicist at Manhattan Project, Oak Ridge, Tennessee.

London-St. Thomas

Alfred E. Trueman, second vice president, and John Tyrer, membership chairman, spoke over TV Station CFPL December 3. A local drive was in order but, to widen the audience interest, tool engineering as a vocation was discussed with Pat Murray, master of ceremonies of the station.

Grand Rapids

The annual Industry and Education Night was held November 11 at the Park Congregational Church, where Walter A. Klein, plant manager, Saran Division, Dow Chemical Company, took for his topic "A Better Life through Creative Manufacturing — the Saran Wrap Story."

Evansville

At the technical meeting held November 11 in the Hadi Temple, 68 members heard Harry Conn, chief engineer of Scully-Jones & Company, speak on production tooling problems. Walter Fuchs, a local businessman, was coffee speaker, presenting a short talk on "Where Are Old Cars Going?"

Keystone

At the dinner and technical meeting held November 18 at Scranton, Harry Conn, chief engineer, Scully-Jones & Company, spoke on "Optimation, a New Machining Concept." At the request of Mr. Conn, Ray Litanski, a local machine-shop foreman at Daystrom Instrument Co., spoke briefly about applying the theory of optimation to a chucking machine and saving $20 per day. Mr. Conn filled in as a coffee speaker, telling of his experiences in Japan.

Lehigh Valley

"Balancing" was the interesting topic which brought 50 members to the October meeting at Hotel Traylor. The speaker, Ralph T. Buscarello of Stewart-Warner Corporation, in presenting his material, gave the results of his practical experience in the field of dynamic balancing and practical vibration problems.

Lima

At the technical meeting held November 21 in Clemans Building, 57 members heard Henry J. Bender, manager engineering services, Westinghouse Electric Corp., as he traced the history of the inclined plane in Greek times to its present status of the common screw. A panel followed consisting of Darrdle Miller, supervisor quality control, Westinghouse; Aubrey Ozias, field engineer, Threadwell Tap & Die Company; and Ray Schimpf, Westinghouse, answered questions from the floor. John Kuck was named chairman of the nominating committee.



SCHUYLKILL VALLEY—National ASTE President H. E. Collins, third from left, at the November 12 meeting with, from left, Samuel Kuba, chairman, and Chauncey R. Kay, program chairman, both of Lehigh Valley. At Mr. Collins' left are Ed Hollingsworth, ASTE National Director; William L. Woodworth, program chairman; and John H. Quinn, Jr., chairman, Schuylkill Valley. —*W. Robert Yeich*

Chips and Chatter



PEORIA—A group of hungry tool engineers fill their plates after the election of the nominating committee at a recent stag party. —*S. J. Schumacher*

Lorain County

The regular monthly meeting was held November 7 at Gartner's Inn, Elyria. Forty members heard J. S. Tipton, field engineer, and Milton P. Smith, process engineer, Denison Engineering Division, American Brakeshoe Company, speak on "Oil Hydraulics on the Production Line." A movie, "The Multipress and How It Is Used," showed hydraulic presses ranging from one ton through 100 tons in operation, doing staking, broaching, pressing, riveting, sizing and assembling. The meeting closed with a question period.

Northwestern Pennsylvania

December 5 was the date for the monthly dinner meeting and technical session at the American Legion Home in St. Marys, where Harold A. Byron, engineering supervisor of the Bell Telephone Company gave an interesting and well-received lecture-demonstration of a pockt-size solar battery, with which he operated a small motor. He also talked over a telephone circuit powered by a beam of light. Each member present was presented with a pocket saver and booklet entitled "The Story of Measurement."

"Tool Steels, Use and Misuse" was the subject of a talk given by George J. Schad, member of ASTE and ASM, and metallurgist, The Carpenter Steel Company, at the Moose Home, November 7. A pin was presented honoring Past Chairman Ken Stoll, and the nominating committee was named for 1958.

Monadnock

At the technical meeting November 21, at Keene, members in attendance heard Charles Riordan, New England representative for Johnson Wax Company, speak on "Wax as a Lubricant for Metal-Cutting." Mr. Riordan stressed the fact that wax, although more expensive than competing cutting oils, has the advantages of staying put and lubricating under pressures of 200,000 psi. It continues to lubricate at temperatures above 450 F and its high polarity causes it to cling tenaciously to metal surfaces.

Memphis

At the November 9 meeting, King Cotton Hotel, "Hydraulic Press Blanks" was the subject of a talk presented by Jim Woodward, Jerry Tipton and Carl Sherman, all of whom are affiliated with Denison Engineering Division, American Brake Shoe Company. Following the talk, a nominating committee for 1958 officers was elected.

A social period and dinner preceded the ladies night session on December 13 in the Gourmet Room, Park Tower Restaurant. Carl Stokes, a Memphis attorney, presented a talk.

San Antonio

November 13 was the date of the technical dinner meeting held at Youngblood's, where Ralph S. Guess, chief tool engineer, Vulcan Tool Company, spoke on "Low-Cost Jig Grinding."

A short business session elected the nominating committee for 1958 officers.

Louis-Joliet

Two hundred people were in attendance at the November 19 smorgasbord meeting, Woodruff Hotel, where Earl G. Planty, professor of management, College of Commerce and Business Administration, University of Illinois, spoke on "Developing More Effective Leaders." Dr. Planty is a well-known authority on executive development, and has acted as a consultant to many schools and colleges in their executive development programs.

National President Harold E. Collins was the special guest speaker.

Springfield, Ohio

Following a dinner meeting at the Rustic Inn on November 12, members heard Albert B. Albrecht, research metallurgist for Monarch Machine Tool Company, Sidney, Ohio, speak on "Single-Point Turning Operations."

Windsor

Richard S. Hildreth, chief engineer of Michigan Tool Company, was the speaker at the Past Chairmen's Night meeting held at the Prince Edward Hotel December 9.

One hundred twenty one members and guests met for the November meeting, which was sponsored by A. C. Wickman, Ltd. Edward Hackenson, general manager of Machine Manufacturing Division, Sheffield Corporation, delivered some interesting information on crush form grinding. He outlined the development work that has been undertaken to date in this field and proceeded to illustrate the many potential applications for this type of tooling. By the use of slide films, Mr. Hackenson demonstrated the economies of crush form grinding.



KANSAS CITY—From left to right are W. L. Enright, president, Ellfeldt Machinery Company; and chapter officers, Lewis F. Alley, treasurer; Ralph E. Adkins, chairman; Dan E. Anderson, second vice chairman; Gary J. Schroer, chairman, Constitution and Bylaws; and Joseph M. Haake, editorial chairman. —*Joseph M. Haake*

Worcester

"Design and Manufacture of Cheaper and Better Mousetraps" was the title of a talk given by Harry I. Dixon, president of Metallurgical Products Company at Putnam & Thurston's Restaurant at the November 12 meeting. The talk covered procedures in investment casting by lost-wax and frozen-mercury processes.

Portland, Oregon

Milton K. Davis, associate professor, University of Oregon, lectured at the technical dinner meeting November 21 at Burns Restaurant. His topic was "Industrial Psychology." At a previous meeting 39 members heard Edgar F. Shepherd, production engineer, The American Tool Works Company, speak on indexing trunnion jigs for radial drill presses and the economy of jigs for production cost cutting.

The coffee speaker was L. K. Shumaker, president of Benke Walker Business College, who gave an interesting talk on "Memory Training."

Western Reserve

Harry Conn, chief engineer of Scully-Jones & Company, was the featured speaker at the November 26 meeting at Cafe 422, Warren. Mr. Conn spoke on "A New Machining Concept—Optimation." The objective of this presentation was to explain the optimum cutting speed or the minimum manufacturing-cost cutting speed, which he did step by step by charts and formulas.

Paterson

A series of six lectures sponsored by the chapter in cooperation with Crucible Steel Company of America, began on October 21 with the following men from the company presenting the lectures: R. K. Dunn, chief metallurgist, led out with the subject "High-Speed Steel." Following this, October 28, was "Tool Steels for Metal-Forming. Stamping and Trimming Dies" by J. R. Richards, tool steel engineer. On November 11, R. B. Ganley, tool steel engineer, spoke on "Steel for Shock Tools and Cold Heading," and "Tool Steels for Plastic Molds and Die Casting Dies" was the subject by E. E. Lull, assistant product manager of Tool Steel Division on November 18. On November 25, A. G. Hamamjian, tool steel service engineer, spoke on "Machining and Machinability" and R. Eason, metallurgist, concluded the series with "Heat Treating" December 2.

Twin Cities

A talk on "Tape Controls for Machine Tools and Automatic Inspection Machines" was given by William S. Tandler of Warner & Swasey Company, at the December 4 meeting in the Dyckman Hotel, Minneapolis. Scholarships were awarded to Charles Storm of University of Minnesota; Duane Treiber of Dunwoody Industrial Institute; and Larry Grundhofer of St. Paul Vocational High School. Each winner was also awarded a student membership.

At the November meeting, William S. Wagner of E. W. Bliss Company, conducted a technical discussion on "Press Metalworking," accompanied by films. One hundred members traveled by bus and chartered automobiles to Owatonna in October where they were taken on plant tours of Owatonna Tool Company and Tube Company.

Portland, Maine

The Hotel Falmouth was the place of meeting, Father and Son Night, December 6, where a good attendance heard Richard L. Rouviere, market extension engineer, Devcon Corporation, speak, followed by a fine member participation in a discussion period.

Schuylkill Valley

A special technical meeting was held November 12 at Berkshire Hotel with Lehigh Valley members as guests. National ASTE President Harold E. Collins spoke on "Machines, Fixtures and Tool Engineers Abroad."

Samuel Kuba, Lehigh Valley chairman, acted as coffee speaker, highlighting coming events at the 1958 show.

North Texas

Vice President D. A. Trescott of the Super Cut Distributors, Incorporated, showed an interesting Kodachrome film on diamond mining in South Africa at the November meeting, held at the Amon Carter International Airport.

Santa Ana Valley

The highlight of the December 3 meeting at Palm's Restaurant, Anaheim, was presentation of an award to Ray Journeay, program committee chairman, for his contributions of textbook writings and data. Pete Noling and Nicholas Brown of Linde Company attended the meeting; the former was coffee speaker and Mr. Brown gave a fine report on flame plating, with an invigorating question and answer period following.

Phoenix

The November 11 meeting at the Westward Ho Hotel began with a social hour, after which Paul Garmus, field engineer, Graphitic Steels, Timken Roller Bearing Company, gave a talk. This was followed by a question period.



ROCHESTER — Russell C. McCarthy, center, spoke on "What's Ahead in Manpower and Labor" at a recent meeting. Pictured with him are: S. B. Hagberg, education chairman, left; and C. E. Sears, chairman. —*Carl W. Greenman*

Toledo

John Bauer, chief manufacturing engineer, Clyde Division, Whirlpool Corporation, was host to some 200 members at the plant tour of his company, November 13. Refreshments and gifts followed the tour.

On November 19 at E.S.T. Club Rooms, Secor Hotel, the nominating committee was selected for 1958 officers.

Wichita

On November 13 at the dinner meeting at Hotel Eldorado, 100 members heard J. D. Spivey, Arrow Engineering Company, and Bill Delaney, coowner, Arlington Industries, talk on tracer valves and controls, with films and description of the Arrow Profiler by Earl Brane. A plant tour of Arlington Industries, conducted by Bill Delaney, followed.

Long Island

December 9 was the date of the meeting held at Garden City Hotel, where William S. Holloway of Madison Industries, spoke on "Modern Gun Drilling." The chapter continued its scholarship program with the presentation of two awards.

At a previous meeting, "Modern Carbide Tools" was the subject of Paul F. Hawkins, export manager for Monarch Machine Tool Company, after which the nominating committee for 1958 officers was elected.

Coming Meetings



ASTE Tool Show and 26th Annual Meeting, May 1 through 8, at Philadelphia. Show at Philadelphia Convention Center.

National

Cleveland Area Ceramic Tool Seminar, Jan. 24, 8 a.m. to 5 p.m., Carter Hotel.

Chapter

BUFFALO-NIAGARA FRONTIER—Jan. 9, 6:30 p.m. at the Park Hotel, Lockport. Niagara Falls-Lockport Night. Commander Brannen, Navy Bureau of Aeronautics, will speak.

CALUMET AREA—Jan. 27, 6:30 p.m., Phil Smidt & Son Restaurant, Whiting. "Heat Treatment of Tool Steels."

CEDAR RAPIDS—Jan. 9, 7 p.m., Sheraton Montrose Hotel, Plant representative night. Dinner and social period. J. F. Cachat, works manager, Tocco Div., Ohio Crankshaft Company, will speak on "Induction Heating—Production Applications."

CHAUTAUQUA-WARREN—Jan. 16, 7 p.m., Warren. "Plastic Molds and Their Design" by E. R. Summers, product engineer, General Electric Co.

DES MOINES—Jan. 8, 7 p.m., Des Moines Golf & Country Club. "Barrel Finishing" by J. E. Tschann, Almco Div., Queen Stove Works. Coffee speaker, Ray Townsend of Townsend Engineering Co.

ELMIRA—Jan. 6, 6:30 p.m., Mark Twain Hotel. Plant tour of American LaFrance will follow dinner meeting. Slate of officers will be announced by nominating committee.

ERIE—Jan. 7, 6:30 p.m., G. E. Community Center, 2901 East Lake Rd. "Trend of Rocket Propulsion Development" by R. H. Reichel, design specialist, Bell Aircraft Corp., Research Div., Niagara Falls. Colorsound movie, "Flight to the Future."

FAIRFIELD—Jan. 8, 7 p.m., Eichner's Restaurant, Bridgeport. "You and the Future" by A. E. Diem, vice president, Dictaphone Corp.

FORT WAYNE—Jan. 8, 6:45 p.m., Hall's Dining Room. "Coolants' Role in Machine of Metals" by Clyde Sluhan, President, Master Chemical Corp.

GRAND RIVER VALLEY—Jan. 3, 8 p.m., Doon Valley Golf Club. "Forging of Brass and Centrifugally Casting" by Ken Baird, engineer, Canadian Machinery Corp.

GREATER NEW YORK—Jan. 6, plant tour to the Grumman Aircraft Engineering Corp., Bethpage, L. I.

HARTFORD COUNTY—Jan. 6, 6 p.m., The Hedges. "Mechanical Applications of Plastics" by Richard E. Leary, director of technical services, E. I. du Pont de Nemours & Co. Forum to follow.

JACKSON—Jan. 22, 8 p.m., Goodyear Tire & Rubber Co. plant tour.

KEYSTONE—Jan. 20, 6:30 p.m., Castle Restaurant, Scranton. "Modern Gun Drilling Application" by W. S. Holloway, sales engineer, Madison Industries, Incorporated.

KOKOMO—Jan. 9, 6:30 p.m. "Cobalt Base Alloys and Auto Welding Machining" by Russell Culbertson, development engineer, Haynes Stellite.

LIMA—Jan. 16, 6:30 p.m., Clemans Bldg. "Gun Drilling" by Carl Oxford, Jr., National Twist Drill Co.

LITTLE RHODY—Jan. 9, 7 p.m., Johnson's Hummocks. Discussion on vibratory feeders by W. McKinsey Jr. Syntron Co.

LITTLE ROCK—Jan. 9, 7:30, Hank's Dog House. "Professional Engineering" by Ross Quinlan.

LONG ISLAND—Jan. 9, 8:30 p.m., Garden City Hotel. "Cheaper and Better Mousetrap Design and Manufacture" by Harrison I. Dixon, industrial consultant, Metallurgical Products Co. Other highlights—manufacture of castings (lost wax, frozen mercury).

MANSFIELD—Jan. 16, 7 p.m., Cleckners. "Recent Progress in Cutting Material" by W. E. Montgomery, chief engineer, Carbide Sales, Firth-Sterling, Inc. Movies and slides.

MERRIMACK VALLEY—Jan. 9, 6:45 p.m., Rex Grille, Lowell. Dinner, followed by technical session, 8 p.m. "Carboloy Machinability Computer" by John Galvin, sales engineer, Carboloy.

MID-HUDSON—Jan. 14, 6:30 p.m., The Mirabelle Restaurant. "Ceramic Cutting Tools" by D. A. Dobbins, application engineer, Diamonite Prod. Mfg. Co.; also a 10-minute film.

MONTREAL—Jan. 15, 7:45 p.m., Bradner's Room, Canadian Legion, Mountain St. "Do It Yourself—Automation" by Hale S. Cadieux, New York district manager, Bellows Co. Film, "Operation Push Button."

MUNCIE—Jan. 7, social hour 6 to 7 p.m., Empire Room, Delaware Hotel. Company representative of Gisholt Machine Tool to speak.

NEW HAVEN—Jan. 9, 6:30 p.m., Hotel Garde. "No Frontiers in Industry" by Mr. Meehan, Brown & Sharpe.

NORTH TEXAS—Jan. 10, 8 p.m., Executives Night, Amon Carter International Airport, Highway 183. Robert McCulloch, president, Temco Aircraft, will speak.

NORTHERN MASSACHUSETTS—Jan. 21, 7 p.m., Athol. "Value Consciousness in the Drafting Room" by W. L. Healy, laboratory specialist, General Electric.

NORTHWESTERN PENNSYLVANIA—Jan. 2, 6:30 p.m., Moose home, Emporium, dinner, followed by meeting and technical session. "Industrial Diamonds—Techniques and Usage" by Harry L. Strauss, Jr., engineer, National Diamond laboratory.

OTTAWA VALLEY—Jan. 14, 8 p.m., The National Museum. "The Application of Instrument Gages to Production" by F. Meyer, Jr., Instrument Gage Div., Taft-Peirce Mfg. Co.

PETERBOROUGH—Jan. 16, 8 p.m., Peterborough Golf and Country Club. John Welchner of the Metallurgical Service Dept., Timken Roller Bearing Co., will be the speaker.

PHILADELPHIA—Jan. 16, 7:45 p.m., Engineers Club of Philadelphia. "Powdered Metals" by George Karian, sales manager, Powdered Metals Div., F. J. Stokes Mfg. Co.

PHOENIX—Jan. 13, 7 p.m., Westward Ho Hotel. "Automation in Drilling by Remote Control" by V. C. Leif of Aro Equipment of California.

PIEDMONT—Jan. 13 and 14, 6:30 p.m., Winston-Salem (North Piedmont Area) Charlotte (South Piedmont Area). "Wear and Friction" by Dr. E. M. Kipp, Foote Mineral Co., at both meetings.

PITTSBURGH—Jan. 10, 6:30 p.m., Gateway Plaza. "Carbide in Industry Today," Philip M. McKenna, president, Kennametal, Inc.

PORTLAND, ME.—Jan. 3, 7 p.m., Falmouth Hotel. "Pointers on Milling" by C. Jenness Cameron, sales manager, Lovejoy Tool Co., Inc., and past chairman of Twin States chapter.

ROCHESTER—Jan. 6, 8 p.m., Barnard's Exempt Club. Affiliate members night and entertainment program with a 16-mm film entitled "33 Days in Canadian Yukon." Speaker, Elway P. Gray, Gray Grimes Tool Co. and Last Word Sales Co.

SAGINAW VALLEY—Jan. 16, 7 p.m., High Life Inn. Plant tour, Saginaw Steering Gear, plant No. 4. "Welcome Visitors, Plant Features, Highlights" by J. E. Godfrey, works manager.

SAN FERNANDO VALLEY—Jan. 8, 7 p.m., Hody's Restaurant, North Hollywood. "Numerical Control System" by William Freely, Electronic Control System, Inc., Div. of Stromberg Carlson.

SANTA CLARA VALLEY—Jan. 21, 6:30 p.m., Old Plantation Inn, 6:30 p.m. "The Story of Measurement" by Harry D. Greenwood, president, Continental Granite Corp., sponsored by The DoAll Co.

SCHUYLKILL VALLEY—Jan. 14, 7 p.m., Berkshire Hotel, Reading. "Magnesium for Tooling" by a representative of Dow Chemical Co.

SPRINGFIELD, OHIO—Jan. 14, 6:30 p.m., Annual Executives Night at Springfield Country Club. "What's Ahead for 1958" by Dr. William C. Freund, head of Economic and Research Div. of Prudential Life Insurance Co. of New Jersey.

ST. LOUIS—Jan. 2, 6:30 p.m., Ruggen's Restaurant. Father and Son dinner meeting. Two films: one on wild life and one on tool and die making.

TRI-CITIES—Jan. 8, 6:30 p.m., The Rock Island Arsenal. "Optical Tooling Instruments" by J. H. Murphy, technical engineer, Charles Bruning Co., Inc. Final report on ladies night program held on Dec. 7, and general outline of coming events for 1958.

TUCSON—Jan. 14, 6:30 dinner; 7:30 technical meeting, Tucson Inn. "Automation in Drilling by Remote Control" by Vernon C. Leif, West Coast Regional Manager, Aro Equipment Co. of California.

WILLIAMSPORT—Jan. 6, 6:45 p.m., St. Paul's Evangelical Church. Joint meeting with S.A.E. "Story of Measurement" by C. G. Schelly of The DoAll Corp.

WINDSOR—Jan. 13, 7:30 p.m., Prince Edward Hotel. "Coolants and Drawing Compounds" by Mr. Low, sales manager, E. F. Houghton Co.

WORCESTER—Jan. 7, 6:30 p.m. Putnam & Thurston's. "Oil Hydraulics on the Production Line" by Francis R. Springer, Eastern field supervisor, Denison Engineering Co. Movie, "Multipress and How To Use It."

Position Available

SEVERAL SALES ENGINEERS, technically trained, preferably with shop experience. Previous sales work desirable but not necessary if otherwise competent. Permanent well-paid positions to qualified men. Apply by letter, giving complete case history in first letter. Photograph desirable. Russell, Holbrook & Henderson, Inc., 292 Madison Ave., New York 17, N. Y.

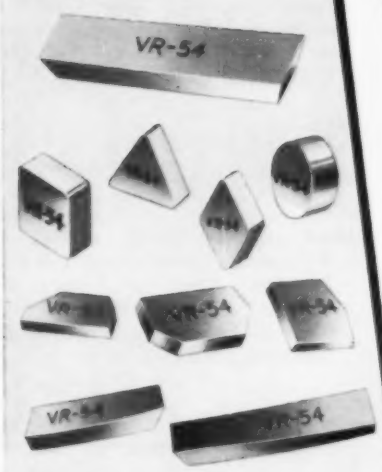
Positions Wanted

POSITION AS PROJECT ENGINEER or production engineer. Fourteen years; experience includes design, development, research, and product analysis. B. S. in ME. Working on M.S. in I. E. Write to: Box 109, News Dept., The Tool Engineer, 10700 Puritan Ave., Detroit 38, Mich.

TOOL ENGINEER WITH A university education, desires new position; will relocate. Is 32 years old, Canadian, and married. Have practical experience in mechanical and tool engineering field: machine shop, inspection, design, toolroom, and administrative ability. Presently employed as designer. Will consider Foreign Trade assignments or representations requiring the use of French or German language, or any interesting position. Write to: Box 108, News Dept., The Tool Engineer, 10700 Puritan Ave., Detroit 38, Mich.

NEW CARBIDE GRADE for MILLING

VR-54



Hardness: 92.0 Rockwell "A"

Transverse Rupture Strength: 325,000 psi.

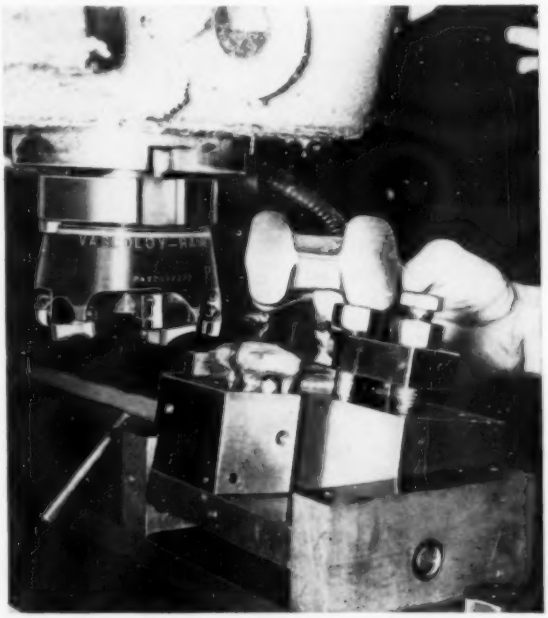
Density 14.50 g. per cc.

NEW VR-54 . . . Outstanding for interrupted cutting of cast iron, chilled cast iron, non-ferrous alloys and non-metallics

This new carbide grade incorporates toughness with high hardness to give the greatest possible resistance to abrasion and shock. These qualities enable VR-54 to outperform other cemented carbides in the removal of metal when milling, broaching, hobbing and rotary burring.

The exceptional uniformity and high quality of this new VR-54 is the result of Vascoloy-Ramet's new and unique process of manufacturing. Typical operations on which VR-54 has proved its superiority are: broaching motor blocks, milling cylinder heads, planing of planer beds, burring stainless steel rings for jet engines, milling ends of motor blocks, burring steel fabricated diesel motor blocks, and in rotary burrs for burring of all types of materials.

For complete information, call your local V-R representative or distributor or write.



MANUFACTURERS OF: CEMENTED CARBIDES, TOOLHOLDERS, TANTUNG® CAST ALLOY CUTTING TOOLS and THROW AWAY FACE MILLING CUTTERS.

Vascoloy-Ramet Corporation

SUBSIDIARY OF FANSTEEL METALLURGICAL CORPORATION

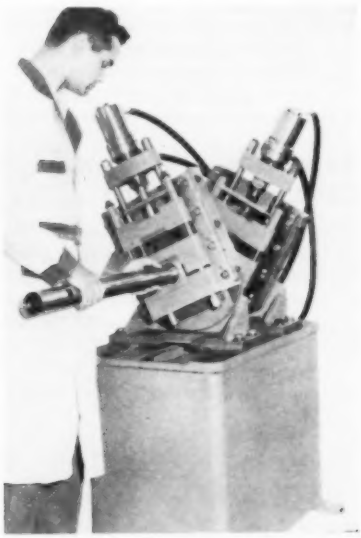
804 Market Street • Waukegan, Illinois

C-649

TOOLS *of today*

Tube-Pierce Machine

Either or both round and irregular shaped holes can be pierced at production speeds up to 600 tubes per hour by this tube piercing machine. Absolute control and support of the tube during the piercing action assures accuracy. There is no distortion to the tube after release from the mandrel. Automatic release of tube from mandrel permits



ease and speed of loading and unloading by a single operator.

Two standard models are available which pierce tubing up to 3 in. in diameter. The AA model pierces two round or rectangular holes at maximum over-all distance of 2¾ in., or cuts a slot up to 2¾ in. in length. The AB model's maximum cutting distance is 4½ in.

Standard equipment with the AA and AB models is the 10-ton capacity hydraulic power unit, complete with electrical panel. It can operate three Tube-Pierce heads simultaneously.

Koppy Tool & Die Co., 1530 Farrow Ave., Ferndale 20, Mich. **T-1-1**

Vertical Milling Machines

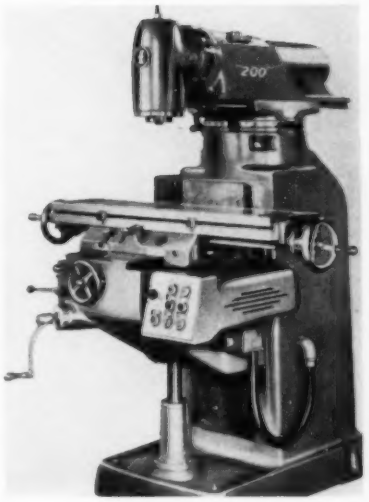
Two vertical milling machines include a 1 hp machine, which is considered primarily a toolroom mill, and a 2 hp machine which is a production type mill. The Famco 100 (1 hp) vertical mill has a precision built spindle head. Speed changes from 120 to 4,300 rpm, or an optional speed range from 75 to 2800 rpm is provided. Speed changes can be made while the spindle is running.

Power feed to the quill provides three feed rates: 0.0015, 0.003 and 0.006 ipr. Above the spindle nose a micrometer depth gage stop is graduated in thousandths of an inch. An overload release clutch is designed to slip at the stop setting or at excessive drill-point pressure and provides consistant, accurate power feed stoppage.

Accurate spindle and quill assembly is made possible by quill diameter of more than 3½ in.

The Famco 200 (2 hp) mill, illustrated, has a production-type spindle head, driven by a built-in motor for a positive and direct power source. The motor rotor, located at the rear of the ram for balance, mounts directly on the first change-gear shaft. Twelve spindle speeds are provided in a range of 80 to 2,100 rpm. A pushbutton control station is remotely located from the button control cabinet. The main motor is protected against overloads by heater elements in the magnetic reversing starter.

Both machines are provided with



heavy construction of the knee, saddle and table. Opening between the knee and the column face allows chips to pass through. The 15-in. diameter overarm turret permits accurate positioning of the spindle head over a large work area. A heavy column dampens cutter vibrations and permits good surface finish with heavy feeds. Positive friction lock arrangement of the 3⅜-in. diameter feed screw dials facilitates resetting of the dial. Antibacklash adjustments on both table and saddle lead screw nuts assure accurate feeding.

Famco Machine Co., Kenosha, Wis. **T-1-2**

Portable Transfer Unit

Standard stamping presses can be converted into fully automated transfer lines up to 60 feet long with this portable transfer unit called the Press Pacer. Suitable for use with both straight-side and gap-frame presses,

this flexible unit is portable, easy to install and can be quickly disassembled.

In use, it sits between presses and has two transfer rails extending the full length of the press line. As the rails slide back and forth, interchangeable and adjustable pickup fingers attached to them carry the parts from one stamping station to the next in a continuous motion, interrupted only by the stamping operation. Presses are tripped by the pickup fingers as they are retracted. The transfer motion is completely mechanical. Interlocking safety switches assure that part transfer and stamping action are properly timed. If not, the operation automatically stops. Transfer rails are made in sections that are easily moved to permit loading of dies into the presses with lift trucks.

Contract Manufacturing Div., The Sheffield Corp., Dayton 1, Ohio **T-1-3**

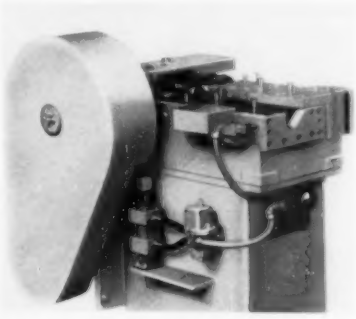
Tube Flaring Machine

High-speed tube flaring machines, Models A-2 and B-2, produce a double flare on steel or nonferrous tubing, at a single tube position. Basic mechanical flare-punching operation is accurate and offers little variation in penetration.

Tube capacity is $\frac{1}{2}$ in. OD x 0.035 steel tubing and up to $\frac{5}{8}$ in. OD for copper, brass or aluminum tubing. Rate of output is 180 strokes per minute (2 strokes per flare) or 90 flares per minute possible at 100 percent operating efficiency. Working height of the machine is approximately 41 in. from floor to center of die.

The machine consists of two basic integrated mechanisms: a motor-driven mechanical press, and a mechanical punch-shifting and tube-clamping mechanism. The motor-driven flywheel is connected to the crankshaft and camshaft through a clutch and thus drives both mechanisms.

Both models are structurally the same except that the method of clutch actuation on Model A-2 is by foot pedal, which is controlled by the machine operator, and it also has a mechanical anitrepeat mechanism.

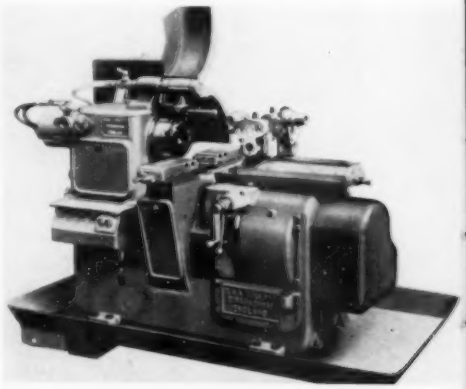


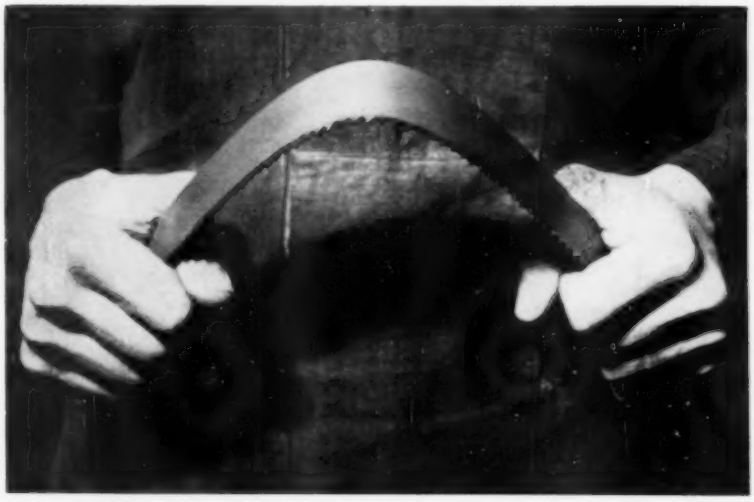
Automation Associates, Inc., 1444 E. 11 Mile Rd., Madison Heights, Mich. **T-1-4**

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Automatic Chucking Machine

This single spindle automatic chucking machine, Model 5M, is useful for machining multiple diameter components and for a variety of tapping work as speed changes can be made "under cut." The spindle also can be run in a reverse direction, while normal feed conditions are maintained. The machine





THIS is No Ordinary Power Hack Saw Blade

This is the *unbreakable* MARVEL High-Speed-Edge Hack Saw Blade—the first bi-metal blade—invented, developed and introduced by MARVEL. This blade is a combination of two materials best suited to the requirements of an efficient hack saw blade . . . a narrow high speed steel cutting edge permanently welded to a tough, non-brittle alloy steel body. Each blade is triple tempered to assure long life and maximum toughness to the cutting edge.

With a MARVEL Blade, you can cut any material—from the free machining steels to the toughest alloys . . . fast, accurately and economically. You can tension a MARVEL Blade from 200% to 300% tauter than any ordinary blade, permitting much higher speeds and heavier feeds without deflection or breakage.

Like all good things, attempted copies of the MARVEL Blade have been numerous, but its performance has been *unequalled* by any of the imitators. Ask for MARVEL Blades by name and you can be sure you're getting the best on the market. Leading Industrial Distributors have them in stock.

Write for latest cutting tool Bulletin and the name of your nearest MARVEL *Distributor.* FB-1020

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ARMSTRONG-BLUM MFG. CO. 5700 W. Bloomingdale Ave., CHICAGO 39, U.S.A.
FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-1-156

is entirely automatic apart from chucking. Use of air chucks minimizes idle time and relieves the operator from the strain of using a chuck wrench at short intervals.

Because of easy change-over, accessibility of dogs for setting feed stroke, rapid motion and wide range of spindle speeds, three changes of which are automatic, the machine can be used economically for small batch work. Drive to machine spindle is through worm and wheel and pick-off gear, all clutches and operating mechanism being dispensed with.

Maximum swing is 7¾ in., maximum swing over cross slides is 6⅝ in. Working stroke of turret is 5 in., cutting travel of turret is 4⅜ in. Distance from spindle flange to turret face ranges from 17¼ in. max to 10¾ in. min. Total speed ranges from 58 to 1,458 rpm; total feed range is from 0.0035 to 0.046 in.

Represented in the United States by Ferdinand J. Snow Co., 333 Old Hook Rd., Westwood, N. J. **T-1-5**

Test Gages

This series of precision test gages is designed to allow a 360 deg calibration.

Test gage performance permits readings up to 15,000 lb. Production calibration of 15 percent full scale accuracy is guaranteed. Flush, wall or stem mount are available. Sizes range from 60 to 15,000 psi.

Martin-Decker Corp., 3431 Cherry Ave., Long Beach 7, Calif. **T-1-6**

Granite Riser Blocks

Accurate height gage readings on parts with higher than normal check points are facilitated by an "air lift" feature that permits fingertip control of the 300-lb blocks. These riser blocks provide an accurate granite surface parallel to the working surface plate and at an elevation sufficient to allow use of standard height gages. There is no effect from vibration or chatter.

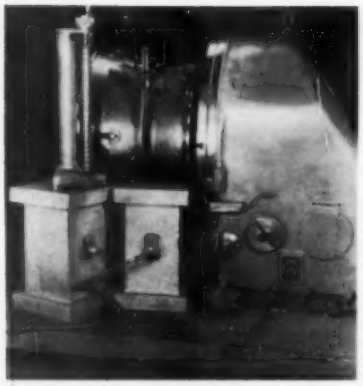
The air lift feature actually floats the block on a cushion of air and there is no wear on the surface plate or the block itself while it is being moved from one position to another.

Air, at about 40 psi, is piped into a hole in the back of the block and led to a series of grooves on the bottom surface. There are no grooves within two inches of the edges; therefore, the block cannot "float off" the surface plate. When the block has been positioned, the air supply is shut off and the block becomes stationary.

Typical granite riser blocks are 24 in. high and 14 in. across the top and bottom. They are also available in



SUPREME PRODUCTS CORPORATION
2222 S. Calumet Ave., Chicago 16, U.S.A.
A DIVISION OF A•S•R PRODUCTS CORPORATION
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square or cylindrical shapes and in various sizes. Top and bottom clamping edges are optional. Top and bottom surfaces are flat to a maximum reading of 0.000050 in. and parallel within 0.000075 in.

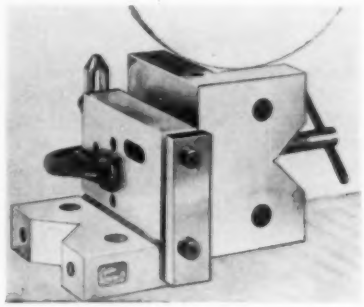
The Herman Stone Co., 1860 N. Gettysburg Ave., Dayton, Ohio **T-1-7**

Angle Plate

Master V-block angle plates are made of machine steel, uniformly carburized and hardened to a depth of 0.070 in. per side with a surface hardness of 64 to 66 R_C. The plates maintain dependable accuracy over a long period of time. All surfaces have equal case thickness.

A side gage, which may be attached to either side, automatically provides for positioning the work precisely and positively without the aid of a surface plate or square. There is no need to remove the angle plate from the chuck to the surface plate for setups. Required setup time is a matter of seconds.

The adjustable parallel, which attaches to the side of the angle plate and is infinitely adjustable, provides a



work shelf of desired height. A stepped clamp with elongated slot provides a means for holding very small pieces with ease and accuracy.

A Vee 1 in. long, which holds work from ⅛ to 2¼ in. diam is exactly center and parallel within the tool's guaranteed accuracy.

Two stock models are available; No. 8 is accurate within 0.0002 accumulated error on all surfaces and over a 4 in. distance; No. 8-L, with a lapped finish, is accurate to 0.0001. Matched pairs in either model also are available.

A 5-in. sine bar with sides lapped square to top surface is listed as an accessory.

Lassy Tool Co., Plainville, Conn. **T-1-8**

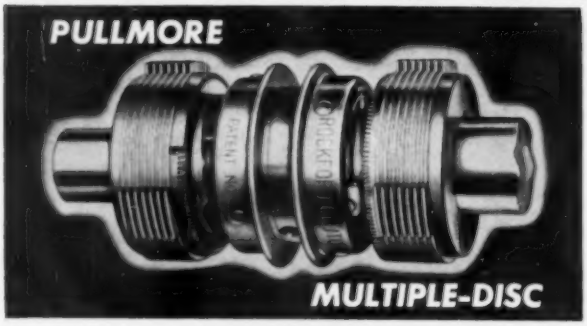
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Testing Machine

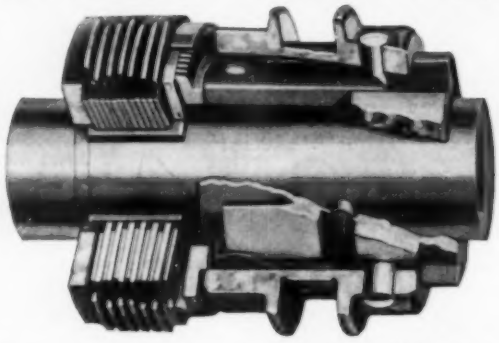
Test data such as offset yield strength can be obtained immediately by this electromatic testing machine. An electric typewriter, used in conjunction with the testing machine, prints data automatically and will record yield strength by the desired percentage of offset, ultimate strength and an identifying test number without operator attention. A series of tensile tests can be conducted in rapid sequence. The test data is printed in columns for easy comparison.

Electronic signals to operate the

ROCKFORD



CLUTCHES ARE PRECISION BUILT



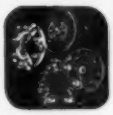
Precision machining and grinding, proper hardening and the symmetrical contours of PULLMORE Multiple-Disc CLUTCHES insure perfect balance and smooth operation at both high and low speeds. Because of this close-tolerance construction and compact design the powerful pull of PULLMORE CLUTCHES is not affected by centrifugal force or the direction of rotation. They handle loads of greater capacity when operated at high speeds. Can be used both to drive and as a brake.

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Shows typical installations of ROCKFORD CLUTCHES and POWER-TAKE-OFFS. Contains diagrams of unique applications. Furnishes capacity tables, dimensions and complete specifications.

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Small Spring Loaded



Heavy Duty Spring Loaded



Oil or Dry Multiple Disc



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Power Take-Offs



Speed Reducers

ROCKFORD Clutch Division BORG-WARNER

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CLUTCHES

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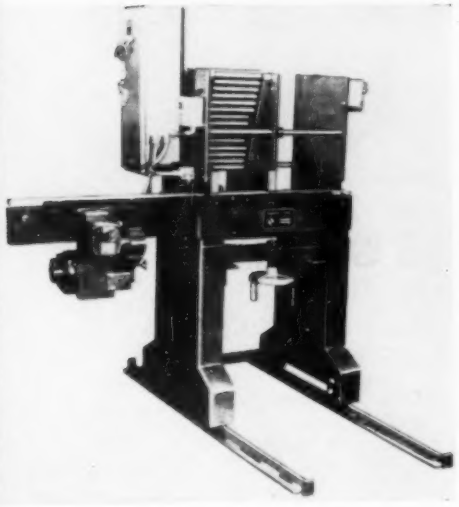
printing control mechanism are generated both by the extensometer affixed to the specimen, and the Selectorange indicating system. The former supplies data on the amount of strain or specimen extension under load, while the latter gives the load applied to the specimen at any instant. These two signals, converted in terms of the selected offset, print out the yield strength on standard letter sized paper. Any other information can be typed as a part of the record since the typewriter has a standard keyboard.

Tinius Olsen Testing Machine Co., 7300 Easton Rd., Willow Grove, Pa.

T-1-9

Magazine Loader

Designed for feeding long bars or tubing into centerless grinders, polishing machines, heat treating equipment, and for other operations where parts are to be automatically fed in an end-to-end position, self-contained Model 8000 loader is ready for immediate installation at the machine to be fed. Parts loaded into the unit's hopper are cycled by an automatic switch, escapement and agitator mechanism, to a steel



conveyor belt which then delivers the parts to the production machine.

The magazine hopper is fully adjustable to permit handling parts ¼ to 2¼ in. in diameter and 3 to 24 in. in length and permits loading up to 2.200 ¼-in. diameter pieces.

The conveyor is powered by a ¼ hp motor and is provided with a variable speed drive which controls cycling rate and permits conveyor speeds ranging from 5 to 20 fpm.

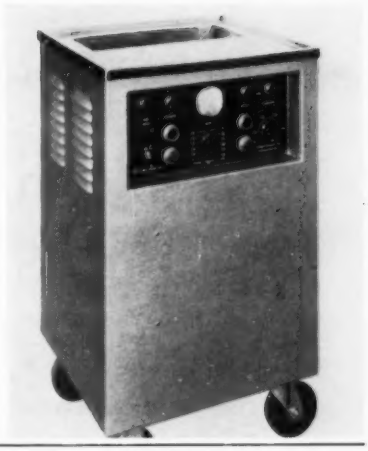
Magazine and conveyor height are adjustable by means of a hand wheel. The V track mounting of the unit facilitates lining up the loader with the production machine, and also permits moving the unit out of the way when changing grinding wheels. A floor lock assures rigid positioning of the unit when in operation.

Production Feeders Corp., 3130 Johnnycake Ridge Rd., Mentor, Ohio.

T-1-10

Ultrasonic Cleaner

Self-contained ultrasonic cleaning setup in a single cabinet incorporates a heater, temperature control, filtration and recirculation system in addition to the ultrasonic generating equipment. Overall dimensions of this Model R-50 are 22 x 19 x 37 in. high. Piping, pump





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GROUND-FROM-THE-SOLID

DRILLS

Right you are when you specify Ace Ground-from-the-Solid Drills! Chances are you'll find the expanded Ace line includes standard stock drills that are tailor-made for your job. Long ones, short ones. Big ones, small ones. Drills made of top quality, uniformly hardened high speed steel. Carbide tipped and solid carbide drills, too. What's more, you'll find that every Ace drill is *pointed right* for you . . . finished with highly polished flutes and stronger, keener cutting edges that resist wear and breakage, stay on the job longer. So be right, buy right . . . specify "Ace".

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ADRIAN, MICHIGAN

Originators of Ground-from-the-Solid High Speed Steel Drills

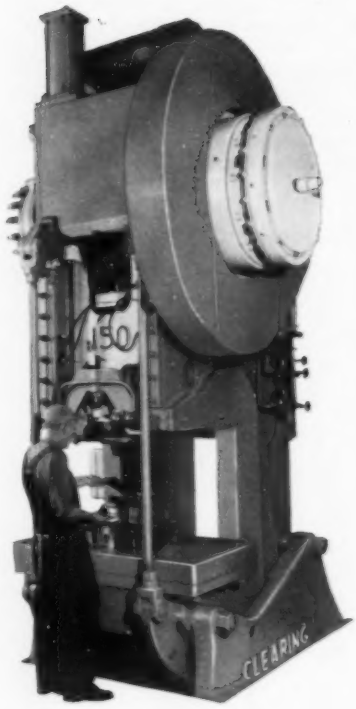
Taper Length Drills	Stub Length Drills	"Hi-Brinell" Drills	Carbide Tipped Drills
12"-18" Longboy Drills	Heavy Duty Drills	Solid Carbide Drills	Step and Subland Drills
Hardened H.S.S. Blanks	Slow Spiral Drills	Taper Shank Drills	"L" and "M" Plastic Drills
General Purpose Drills	Fast Spiral Drills	Chucking Reamers	Drill Length Reamers

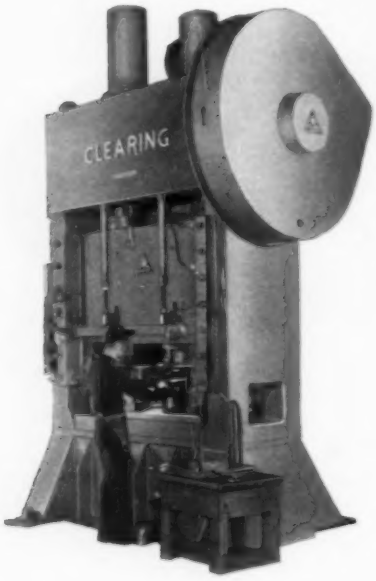
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When the backbone of your production depends on O.B.I.s, you want machines that you can rely on. That's why Reliable chooses Clearing's. As a contract stamping shop they need dependability and efficiency. Their O.B.I.s range from 75 tons to the 150 ton machine shown here. "Reliable", says Reliable, "That's Clearing."





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Heavy tonnage high up on the stroke—that's what Tait Mfg. Co. in Dayton, Ohio needed to draw stainless steel pressure vessels. The solution was this 250 ton double crank press with a 500 ton drive. Accurate, dependable operation without troublesome maintenance. That's typical of the Clearing Series-S press. Want details and catalog? Just write.

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CLEARING MACHINE CORPORATION—*division of U.S. INDUSTRIES, INC.*

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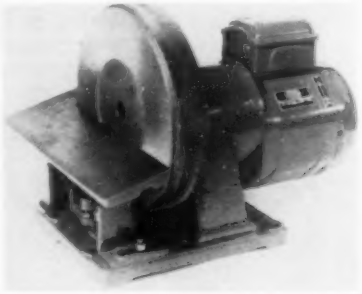
and filter are of stainless steel, with Teflon gaskets, making the unit suitable for alkaline solutions, solvents and mild acids.

Size of the tank is 6 x 16 x 11 in. deep, with a total working volume of 5 gal. The transducers mounted to the bottom have a rated input of 250 r-f watt average (1 kw peak), which they convert into mechanical vibrations at 38 kc.

Branson Ultrasonic Corp., Stamford, Conn. **T-1-11**

Rotary Power Tool

The R-Filemaster provides fast cutting action for such production and toolroom work as filing, shaping and milling on metals and plastics processed in any form of bar stock, castings or extrusions. Sticky materials and those tending to smear are easily handled. The compact unit has motor-driven rotating tools with curved teeth of hardened tool steel. Rake of the cutting edges and curvature of the teeth are



designed to form a rolling chip which is eliminated radially. A one-hp, two-speed, 120 and 240-rpm, fully enclosed motor drives the filing tools by means of a spur gear reduction unit. The illustrated model displays a 45-deg tilt worktable and a circumferential 1½-in. file ring. Rings are available in fine, medium and coarse cut.

Hudson Automatic Machine & Tool Co., 137-139 Thirty-Eighth St., Union City, N. J. **T-1-12**

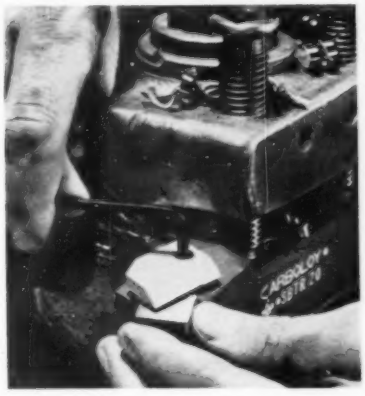
Toolholders

Line of Carboloy toolholders, called Lift-O-Matic, features a one-piece chipbreaker-clamp that functions automatically, and a clamp screw accessible from top or bottom. Other features are a carbide-surfaced chipbreaker that prevents braze failure, a high-strength heat-treated shank and a solid carbide insert seat. The tool is comprised of only five standardized replacement parts. Chip flow is smooth and unobstructed.

Clamp and chipbreaker are combined into one unit, which lifts or low-

ers automatically as the clamp screw is turned. Clamp is designed to move up or down on the clamp screw to eliminate the problem of sticking in the shank. Indexing is fast and easy from any position.

Shoulders of the toolholders are cut



away for smooth, unobstructed chip flow. Depth of cut is limited only by the insert.

Metallurgical Products Dept., General Electric Co., Detroit 32, Mich.

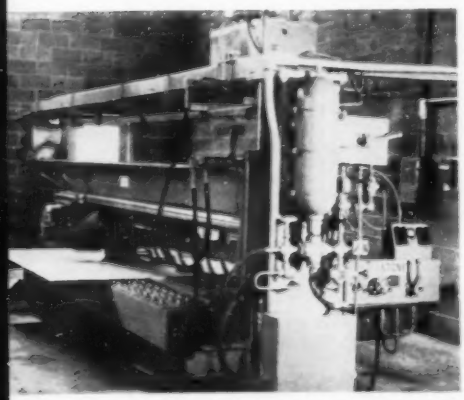
T-1-13

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Cutting Machine

This hydraulically operated traverse type cutting machine, Model T-20, cuts 1-in. stainless steel at approximately 3 fpm. Stainless steel sealed roller ways provide long, continuous, accurate cutting. A totally enclosed floating type safety guard assures maximum safety during operation.

Powered by a 20 hp geared-in-head, T.E.F.C. induction type, continuous duty motor, machine has a virtually unlimited cutting capacity. The cutting head may be operated laterally at any



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Check the press or literature in which you are interested. Tear out the page and send it to Clearing.


Straight Side Hydraulic

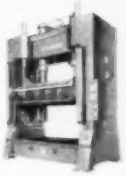

Bottom Drive Mechanical


Top Drive Mechanical

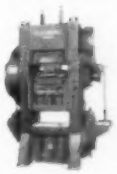

O.B.I.


Gap Frame


Trimming

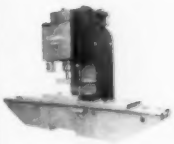

Die Spotting


Transflex Modular


Knuckle Joint

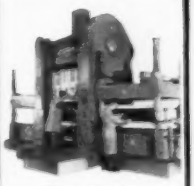

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Forging


Straightening


Series-S


High Speed


Moving Bolster


Column Type Hydraulic with Rubber Pad

AND MANY MORE



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- ☐ Unusual Press Applications
- ☐ Clearflo Lubrication
- ☐ Plunger Guiding
- ☐ Overload Device
- ☐ Micro-inching
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6499 W. 65th Street—Chicago 38, Illinois / Hamilton Division, Hamilton, Ohio

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speed from 0 to 50 fpm and raised or lowered 0 to 10 fpm. A work stop gage is located at right angles to the kerf; stock is held down by hydraulically controlled clamping feet.

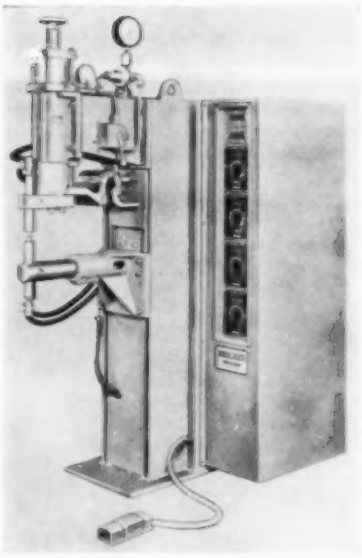
Wheel diameter is 20 x 0.150 in. and arbor speed is 2360 rpm. Larger diameters and speeds also are available. Size of the Model T-20 is 21 x 8 x 8 ft. Length of cut is 12 ft; while the cutting head raises and lowers 24 in. Larger capacities are available.

Stone Machinery Co., Inc., Manlius, N. Y. **T-1-14**

Spot Welder

Standard, air-operated, press type, low impedance, single phase, SP 1 spot welder produces high-quality welds on small or large production runs on a wide range of industrial metals. Available in 30, 50 and 75 kva at 50 percent duty cycle, this welder can be furnished with 18, 24, 30, 36 and 42-in. throat depths. Electrode force up to 1575 lb is provided at 80 psi line pressure.

The pneumatic, double-acting cylinder head is simple in design and efficient in operation. Friction is minimized because of microfinished cylinder walls, and the use of molded synthetic cup seals.

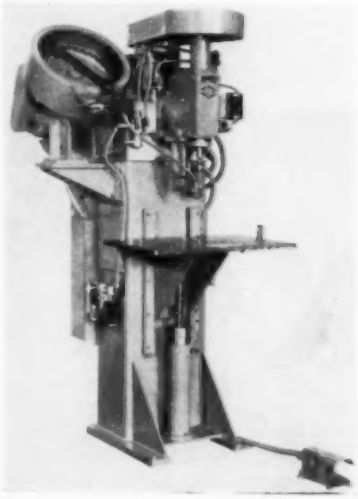


All static contacts throughout the secondary circuit are silver plated for maximum conductivity, and to prevent oxidation and corrosion.

Public Relations, Dept. M-19, Sciaky Bros., Inc., 4915 W. 67th St., Chicago, Ill. **T-1-15**

Stud Driving Machine

Heavy duty stud driving machine can give up to 630 in-lb of driving torque, depending on the motor used. Drivers on this Model STD-1, which will drive standard studs of up to $\frac{5}{8}$ in. diam, Schweppe self-tapping studs and Tap-Lok inserts, are the screw-on or self-opening types. Available with either



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PER PRESS STROKE!



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single or multiple spindles, the machine is equipped with up to 3 hp spindle drive and has air-hydraulic spindle feed.

Capacity of the machine ranges up to 1000 cycles per hour; studs are automatically hopper fed. The stud driver is easily retooled for other applications.

It successfully sets inserts and studs in cylinder heads and crankcases on die-cast aluminum engines and with other die castings.

Recommendations for applications are available from Gray Equipment engineers. The company maufactures and tools the machine ready for use.

Gray Equipment Co., 13600 Ford Rd., Dearborn, Mich. **T-1-16**

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Tapping Attachment

This compact roll tap attachment is a self-contained unit consisting of two hardened and ground steel rollers. Both self-aligning and self-releasing, the attachment allows the tap to move into the workpiece while the turret remains stationary. Consequently there is no problem of friction and drag resulting



from the turret resisting the forward motion of the tap under torque during the cutting cycle.

The attachment is made in four sizes both self-releasing and nonreleasing taps of every pitch, from "0" to 2½ in. Complete set of bushings is furnished with each attachment.

Roll-Tap Corp., 1601 E. 90th St., Los Angeles 2, Calif. **T-1-17**

Nylon Screws

Uniform, molded nylon screws are available for applications where closely held tolerances are important. Initial stock sizes for machine screws are 6-32, 8-32, and 10-32, ranging in length from ⅜ to 1 in. Headless set screws up to 5/16 in. OD and 13/32 in. long are also available. Threads are class 2, unified standard.

The screws provide electrical insulation, high strength-to-weight ratio (higher than steel), stability over a wide range of temperature, and chemical and corrosion resistance. Natural resilience allows them to be used in an interference fit, resulting in a tight, vibration proof assembly without separate devices. Nylon screws are nonmagnetic, nontoxic, fungus proof, and will retain their shape even after sterilization.

Dept. TE, Gries Reproducer Corp., 400 Beechwood Ave., New Rochelle, N. Y. **T-1-18**

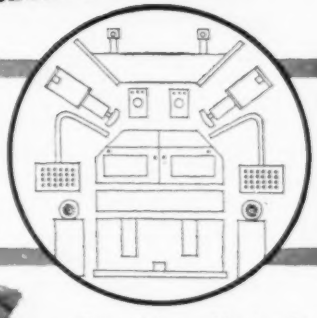
Production Lathe

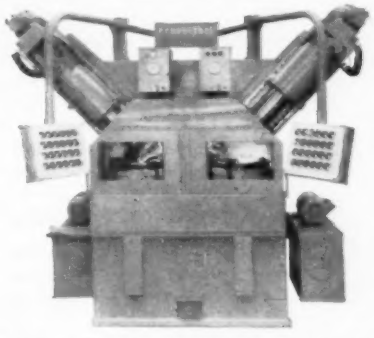
Available in 17 or 20-inch swing this rapid production lathe is fundamentally simple so that features can be added for specific manufacturing assignments. These new lathe designs provide a choice of swing sizes and many basic options. These include choice of speed ranges; on the 17 inch model, 70 to 700 rpm or 105 to 1050 rpm; on the 20 inch model, 57 to 600 or 85 to 900 rpm. Any or all of these specific features are available: hydraulic trac-

SIMPLE AS ABC...

the STANDARD BUILDING BLOCK TECHNIQUE OF MACHINE DESIGN

FORD wanted a machine to finish grind in excess of 100 impeller housings and 100 covers an hour. Frauenthal Division—Kaydon was given the job.





They put the machine together "building block" style... AND SPECIFIED TWO STANDARD SUPER PRECISION SPINDLES. The machine is working right now... turning out 138 pieces an hour on each side, at 80% efficiency.

Standard's new catalogues on Spindles, Slides and Feeds is a handbook of special machine components . . . with complete working drawings, dimensions and capacities. WRITE FOR YOURS TODAY!

America's most complete line of super precision spindles; also slides, feeds and tables. Spindles — motor driven and independent drive — ¼ H.P. to 200 H.P.

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M1238-1818 — *Range 18" x 18", working distance 9" to infinity. Reads to 0.001" up to 24" working distance. Protractor ocular reads to 3 minutes of arc. Image is erect.*

Cut inspection time in half

with new Gaertner

Coordinate Cathetometers

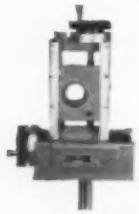
These convenient, reliable optical instruments permit making precise coordinate measurements in a vertical plane. The two dimensions are measured with one setting, object does not have to be rotated. Inspection time is cut in half and resetting errors eliminated.

Versatile Gaertner Coordinate Cathetometers are ideally suited for precision measurements on large objects; also objects or points in recessed, remote, or inaccessible locations. Applications include measuring jet engine sections, complicated castings, printed circuits, bolt holes and bosses on large piece parts, traces on cathode ray tubes, etc.

Because these are optical rather than mechanical measuring instruments, you make non-destructive measurements without contact, distortion, or concern about pressure being applied to the object when making a setting. Instruments available in English or Metric system.

M1236-46— Horizontal range 6", vertical range 4". Reads to 0.0001", working distance 5" to infinity.



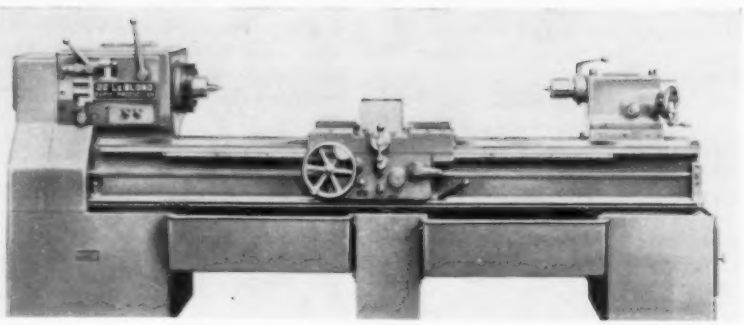


M1236-22— Range 2" x 2", reads to 0.0001". Working distance 5" to infinity. Shown with 19 mm mounting rod, and without telemicroscope. Instrument permits precise coordinate movement of other objects such as photo cells, probes, etc., in place of telemicroscope.

Write for Bulletin 188-53 & 194-57

The Gaertner Scientific Corporation

1241 Wrightwood Ave., Chicago 14, Ill.
Telephone: BUckingham 1-5335
INDICATE A-1-164

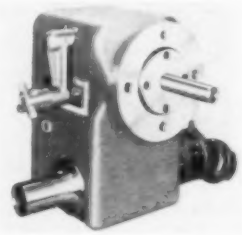


ing, automatic facing, air-operated chucks, quick-acting tailstock, connected rests, taper attachments, turret tool post, cross and length stops.

The R. K. LeBlond Machine Tool Co., Cincinnati 8, Ohio. **T-1-19**

Gearbox

This two-speed precision gearbox can be used with either hydraulic or electric motors. Hardened and ground worm and bronze work wheel are standard Boston design and are available with 1, 2, 3 or 4 threads, depending on the



speed range desired. A spring-loaded indexing handle is provided for selecting neutral, 1:1 or 3:1 ratio.

The unit is equipped with tachometer feedback for speed control.

Tracer Control Co., 595 E. Ten Mile Rd., Hazel Park, Mich. **T-1-20**

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Plastic Molding Compound

A single component thermosetting flexible plastic molding compound has been developed for casting cold-setting ceramics and plastics. The material, called Speedo-set, premixed, is available in one-gallon containers, ready for use in liquid form. It is poured over a suitable pattern, usually made of machined aluminum, and then cured at 270 F for about one hour. Resultant mold offers an accurate close tolerance negative of the machined pattern. After curing, the Speedi-set has a tough flexible composition, and allows casting of lettering and undercuts. From the first pattern, innumerable Speedi-set plastic molds can be produced.

The material requires no special chemical procedures, such as additions of catalysts or hardeners.

Duramic Products Div. Technion Design & Mfg. Co., Inc., 262-72 Mott St., New York 12, N. Y. **T-1-21**

Multipurpose Air Tool

Designed for riveting, peening, swaging, milling and cutting, this pneumatic percussion tool starts and stops automatically when the work is either brought into contact or removed from contact from the hammering point. A foot control is available. Air cushion design of the supporting base serves to reduce vibration. Because of unusually fine adjustments, the tool can be used



on any precision work. Its stroke can be adjusted to work inside recessed pieces.

The bench airtool operates at 5000 strokes per minute with air pressure up to 100 lb at 4 cfm. It has an air pressure adjustment which permits the tool to operate at pressure as low as 10 lb.

Industrial Control Products, Inc., Caldwell, N. J. **T-1-22**

Chain Oiler

Film of oil is automatically applied to chains, gears, slides or irregular surfaces by this oiling unit. It can be mounted at any convenient location and oil is released by gravity either manually or electrically. Precision needle valves on the dispenser meter the amount of oil to applicators. After initial setting the valves require no further attention. Manifolds that can be



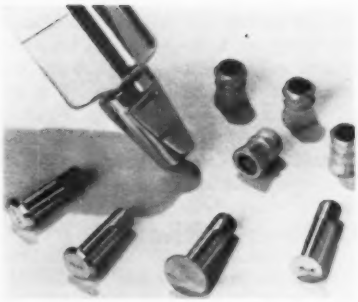
connected in series so a single dispenser will serve as many as twelve outlets are available. For limited or hazardous locations, dispensers can be mounted away from the area to be lubricated, oil being supplied by means of plastic or cooper tubing to the manifolds and applicators.

Applicators withstand temperatures up to 275 F and can be trimmed to any width to avoid overhang and side dripping.

Trico Fuse Mfg. Co., 2948 N. 5th St., Dept. TE, Milwaukee 12, Wis. **T-1-23**

Fastener

Positive fastener with built-in controlled preload has an unusually high strength-to-weight ratio, high fatigue values, simplified tooling, fast silent installation on production lines, easy removal and reuse, and availability in any combination of materials.



The fastener, called the Hy-Lok, combines features of both a bolt and rivet and consists of two basic parts—the threaded pin and a threaded collar.

Hi-Shear Rivet Tool Co., 2600 W. 247th St., Torrance, Calif. **T-1-24**

Drill Press

Model T6-b bench type drill press has capacity up to 7/32-in., hydraulic head raising, sensitive hand feed con-

ARMSTRONG



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Even when labor was cheap and tools were costly, it was the best tooled shops that prospered. Now with wages higher and the work days shorter, it becomes imperative that every worker be supplied with every tool that will increase his hourly production.

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"The Tool Holder People"

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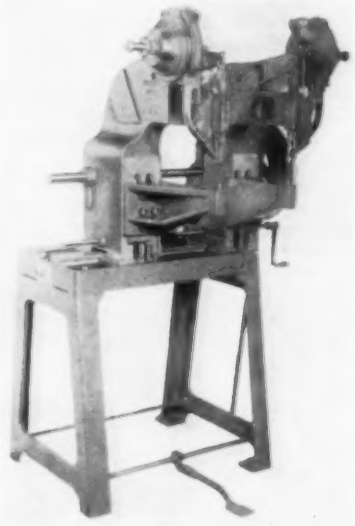
trols with adjustable spring return, and a high precision spindle. The machine is operated by a two-speed ¾ hp motor which permits eight speeds from 3600 to 12000 rpm.

Olivetti Corp. of America, Machine Tool Div., 42-33 Northern Blvd., Long Island City, N. Y. **T-1-25**

Automatic Riveter

Two rivets up to 0.200 in. diam are automatically and simultaneously fed and set by this Model 109 riveter. Rivets may be of different lengths and head diameter specifications. The machine has a 12-in throat, and center distances adjust from ⅝ to 16 in. by hand crank. Minimum center distance can be reduced to ¼ in. by a machine modification. An easy-trip mechanism actuates the machine while a nonrepeat, single revolution clutch makes it safe and simple to operate.

The Model 109 can be furnished as a bench model when equipped with a solenoid trip. It may also be supplied with air operation for fragile, ceramic settings. Other modifications allow it to set rivets up to 2⅞ in. in length. In addition it can be used in combination with Tubular's basic machines to make up a multihead riveter.



Tubular Rivet & Stud Co., Wollaston (Quincy) 70, Mass. **T-1-26**

Limit Switch

This precision limit switch, called the Plug-In Limit, can be replaced on the job in a few seconds with no required adjustments.

The unit consists of two parts: a



POPE *engineers and builds*

20,000

DIFFERENT motorized and Belt Driven

SPINDLES

one of which may be just the one to
LOWER YOUR PRODUCTION COST

Here are only a few representative Pope Precision Spindles:



FOR SURFACE GRINDING

POPE 1, 2 and 3 HP Totally Enclosed 1800 and 3600 RPM Motorized, Cartridge Type Spindles with double row cylindrical roller bearings of enormous capacity for superior performance and long life, plus separate thrust bearings for no endwise movement of the shaft.

FOR HEAVY DUTY MILLING AND GRINDING

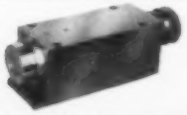


POPE ¾ to 100 HP Direct Motorized Spindles operate in any position — flanged or tapered noses — equipped with super-precision, double-row roller bearings and preloaded ball thrust bearings. Top quality performance is assured on skin milling, grinding, boring and other operations as well as milling.

FOR TOOL AND CUTTER GRINDING



POPE Super-Precision 1 HP, 3600 RPM Motorized Tool and Cutter Grinder Clearance Angle Swivelling Heads provide angular adjustment in a vertical plane. They pay for themselves in time saved. Cup wheels can be used for practically all clearance angles.



FOR BORING ROUND HOLES WITHIN MILLIONTHS OF AN INCH

POPE Heavy Duty Boring Spindles assure smooth, chatter free, continuous high production of accurate parts. Belt driven or motorized, in a wide range of horsepowers and speeds.



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POPE Precision Internal Grinding Spindles have the super-precision bearings to withstand both axial and radial loads and to produce better finished ground holes. Their ability to take heavy cuts means increased production. Wheel life is increased, too. For Bryant, Cincinnati, Excello, Heald, Landis and Norton Grinders.

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POPE Super-Precision, High Frequency, Heavy Duty Spindles are available for speeds up to 100,000 RPM. They are unequalled for low cost maintenance, long life, trouble-free operation and rugged ability to cut metal fast.

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No. 116

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New Pads
SCREWZON®
SWIVEL TOGGLE SHOE CLAMPS



U.S. Patent No. 2,724,297

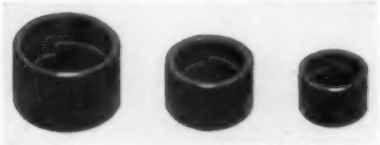
CUTAWAY VIEW OF SCREWZON shows the spring insert in each pad. This holds the screw on, but permits free swivel action—8° in any direction.

8° in Any Direction

Low in Cost! Easy to Use!
On Any Stock Screw
NO MACHINING NECESSARY

The new SCREWZON Swivel Toggle Shoe Pads are the simplest, cheapest, most satisfactory clamps available anywhere! They can be used on ANY SCREW, standard or stock (flat end screws preferable). No machining necessary – NO altering! Pads can be fitted in any mechanical jaw that is actuated by screw pressure. The new, patented SCREWZON Pads will save you time, trouble and money. Order today! Special applications quoted on request.

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INDICATE A-1-167-1

terminal block enclosure, containing wiring connections, and a switch enclosure, including all moving mechanical and electrical parts.

The switch enclosure is fitted with four current-carrying spring plugs, integrally molded to the basic switching element, and the terminal block with four corresponding receptacles. When plugged together, they form a complete switching unit. Actuating arms may be pre-set to avoid on-the-job adjustment.

Micro Switch, Div. of Minneapolis. **T-1-27**

USE READER SERVICE CARD ON PAGE 169 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Power Saw for Plastic

Portable pneumatic power saw and file quickly and easily does key hole, deadend and scroll cutting of plastic materials. Tests indicate the tool operates satisfactorily on hard thermosetting plastics as well as on Vinylite,



cellulose acetate, polystyrene, fiberglass reinforced plastics, and Plexiglas.

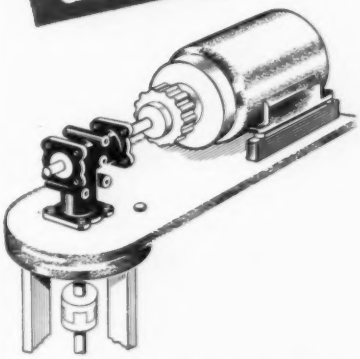
Operating speed and cutting stroke of the saw are easily adjusted. There are only two moving parts, which minimizes maintenance.

Air-Speed Tool Co., 1502 W. Slauson Ave., Los Angeles, Calif. **T-1-28**

Drill Bushing

Designed for laminated plastic drill tools the Flar-A-Lock drill bushing permits a secure press-fit installation after the laminating process is complete. In one quick action the bushing is squeezed into the drilled hole location until the shank end is seated on a stationary flaring tool placed underneath. Wearing surfaces of the bushings are case hardened to 65 R_C, while the shank lip is malleable to allow a concentric flaring action that locks the bushing in place. When the contour or

ANGLgear® simplifies power package design



Drawing based on photo shows ANGLgear power takeoff on power package for liquid tar pump. ANGLgear's compactness and 4-way mounting simplified design of unit, helped reduce size.

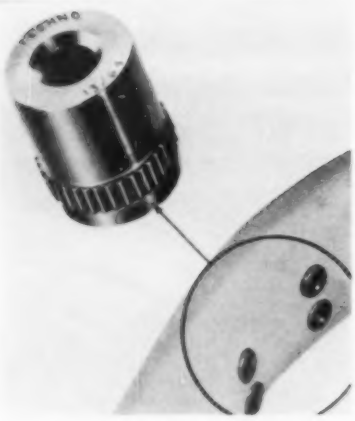
In designing a power package for a portable tar pump used in roofing work, Continental Cleveland Corp., Cleveland, Ohio, needed a simple, compact 90° power takeoff to stand rough service and handle heavy transmission loads.

A Model R-340, 5 hp ANGLgear met these requirements perfectly. Because of its compactness and 4-way mounting feature, it was easily designed into the power train and helped reduce the size of the entire power unit. It also had the necessary stamina to absorb the loads involved in pumping liquid tar to heights up to 90 ft. Completely enclosed, it could not be fouled by the tar.

Perhaps ANGLgear can solve a 90° drive problem for you. Designed for manual or power operation. ANGLgears are available from stock in 1/3 to 5 hp ratings, with 2 or 3-way shafting, and 1:1 or 2:1 gearing.

See our literature in Sweet's Product Design File or contact your local distributor.

AIRBORNE®
AIRBORNE ACCESSORIES CORPORATION
HILLSIDE 5, NEW JERSEY
INDICATE A-1-167-2



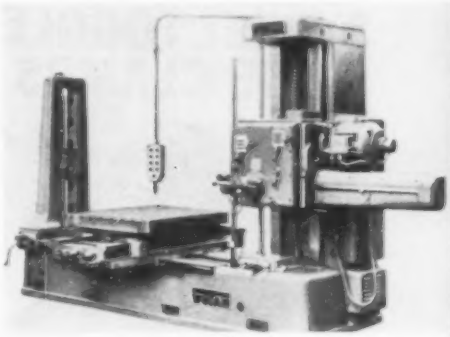
size of the plastic tool prohibits use of a press to install the bushing, a simple hand flaring installation tool and a hammer will accomplish the same results. The bushing can also be installed by conventional plastic tool fabricating methods whereby the bushing is "set" as the tool is being laminated.

Techno-Products Corp., 143 Netherwood Dr., Springfield, Pa. **T-1-29**

Boring Mill

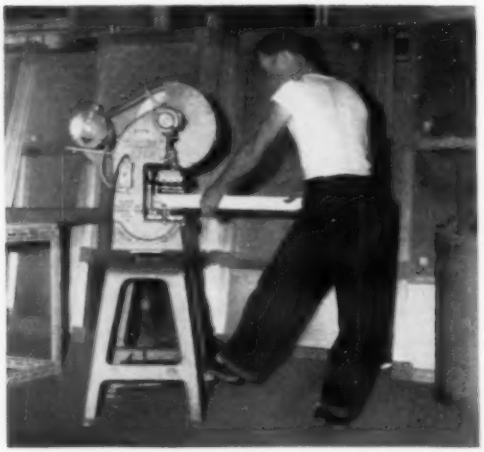
Design of the Wotan No. B85A precision horizontal boring mill incorporates power operated rotary table, nitrided roller bearing spindle, electromagnetic clutches, rapid power traverse throughout, threading attachment, and centralized lubrication and controls. Vertical capacity of this mill is 36 in.; spindle to outboard support is 86 in. Speeds range to 1,000 rpm.

Diameter of spindle is $3\frac{3}{8}$ in.; spindle taper is Morse No. 5. Working



surface of table measures $38\frac{1}{2}$ x $41\frac{3}{4}$ in., and maximum distance from spindle sleeve to boring stay is 87 in. There are 21 spindle speeds and 27 feeds. Rapid traverse is 8 fpm.

Index Industrial Corp., 150 Broadway, New York 38, N. Y. **T-1-30**





D. A. CHALMERS, *President*
Chalmers Inc., Melrose Park, Ill.

"famco POWER PRESSES
give us trouble free
operation . . . no down time."

Not one red cent spent for parts in two years . . . no downtime! And, they did it with Famco Power Presses.

That's the enviable record chalked up by Famco on-the-job at Chalmers Inc., manufacturer of anodized aluminum AIR SEAL windows and doors.

Notching Z bars, punching side rails and crimping inserts are but a few operations these presses handle efficiently, day-in and day-out at Chalmers.

Maybe you'd like lower operating costs, trouble free power press performance. If so, it will pay you to investigate the Famco Power Press line. Famco has over 50 different models to select from—bench or floor, standard or deep throat—in 4 to 18 ton capacity. And, *only* Famco offers 4 great clutch types for its presses.

Learn how Famco Power Presses can save you production time and money now!

Write for **FREE Famco Power Press** *catalog today.*

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AIR PRESSES • ARBOR PRESSES • BAND SAWS • DRILL PRESSES • FOOT PRESSES • POWER PRESSES • SQUARING SHEARS • MILLING MACHINES

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-1-163

USE READER SERVICE CARD ON PAGE 169 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Carbide Reamers

Series of solid carbide chucking reamers includes 21 tools ranging in diameter from 1/16 to 3/8 in. Available from stock in fractional sizes, the reamers from 1/16 through 1/4 in are 4 flute; from 17/64 through 3/8 in. are 6 flute.

Features of the 1564-R Series include right hand spiral flute, straight



shank, precision ground lands, radius chamfer and right hand cutting.

Tolerances of the solid carbide reamers are from plus 0.0002 in. to minus 0.0000 in. reamer diameter, and plus 0.0005 in. to minus 0.0005 in. shank diameter.

Atrax Co., 240 Day St., Newington, Conn. **T-1-31**

Multipurpose Machine

Parts up to 28 in. long can be drilled, centered, spotfaced, chamfered, reamed, tapped, threaded, hollow milled or bored on this special double-end machine. Designed to perform opposed operations simultaneously, the machine

THE TOOL ENGINEER'S *Service Bureau*

TRADE LITERATURE CURRENTLY OFFERED BY THE TOOL ENGINEER ADVERTISERS

Literature Number	COMPANY	DESCRIPTION
A-1-257-1	Ace Drill Bushing Co., Inc.	**Drill Bushings**—New catalog lists both finished and unground bushings, list prices, technical data and name of nearest distributor. (Page 257)
A-1-30	Acme-Danneman Co., Inc.	**Die Sets**—Catalog includes listings of standard and Swiss die sets, bushings and accessories. (Page 30)
A-1-16	Allegheny Ludlum Steel Corp.	**Tool Steels**—Catalog contains data on FCC Air Hardening, Oil Hardening and other Cast-To-Shape Tool Steel Specialties. (Page 16)
A-1-261	Almco Div., Queen Products, Inc.	**Barrel Finishing**—New barrel finishing handbook contains photos, data and cost comparison charts. (Page 261)
A-1-12	American Tool Works Co.	**Radial Drills**—Bulletin No. 328 describes "Double Lo-Hung" spindle drive for "American" hole Wizards. (Page 12)
A-1-236	Ampco Metal, Inc.	**Materials**—Ampco copper-base alloy metal described in Bulletin 33. (Page 236)
A-1-156	Armstrong-Blum Mfg. Co.	**Hack Saw Blades**—Marvel catalog gives story on Marvel metal-cutting saws. (Page 156)
A-1-165	Armstrong Bros. Tool Co.	**Machine Attachments**—Toolholders, setting-up tools, wrenches, "C" clamps and other accessories described in catalog. (Page 165)
A-1-197	The Atrax Co.	**Cutting Tools**—"Standard Reference" contains case histories on carbide tooling. (Page 197)
A-1-225	The Bellows Co.	**Air-powered Devices**—Bellows Air-Motor valve combinations described in catalog. (Page 225)
A-1-258	The Blanchard Machine Co.	**Grinding Machines**—18-C folder describes Blanchard 18-C surface grinder. (Page 258)
A-1-229	E. W. Bliss Co.	**Die Supplies**—New catalog describes standard and special die sets and diemaker's supplies. (Page 229)
A-1-63	The Challenge Machinery Co.	**Measuring Equipment**—Catalog 838W contains data on Challenge Precision surface equipment. (Page 63)
A-1-32	Cincinnati Grinders Inc.	**Grinders**—Cincinnati Filmatic grinder described in catalog No. G-577-6. (Page 32)
A-1-195	Circular Tool Co., Inc.	**Cutting Tools**—Catalog O contains data on Circle R saws. (Page 195)
A-1-37	The Cleveland Twist Drill Co.	**Cutting Tools**—Booklet illustrates Cleveland carbide-tipped and solid carbide cutting tools. (Page 37)
A-1-182	Arthur A. Crafts Co., Inc.	**Carbide Form Tools**—Catalog available on "Complete Carbide Tooling for Automation." (Page 182)
A-1-8	DeVlieg Microbore, Div. of DeVlieg Machine Co.	**Special Tooling**—Microbore Flash-change system described in Catalog No. 57. (Page 8)
A-1-50	The DoAll Co.	**Band Saws**—Catalog contains listing of DoAll band tools. (Page 50)
A-1-199	Eastman Kodak Co.	**Photography**—"High-Speed Motion Pictures at the Service of the Engineer" shows engineering applications. (Page 199)
A-1-IBC	Ex-Cell-O Corp.	**Drill Jig Bushings**—Catalog lists complete line of Ex-Cell-O drill jig bushings. (Inside Back Cover)
A-1-168	Famco Machine Co.	**Power Presses**—Catalog gives engineering data on Famco power presses. (Page 168)
A-1-44	The Foote-Burt Co.	**Broaching**—Circular No. 503 gives engineering data on surface broaching. (Page 44)
A-1-164	The Gaertner Scientific Corp.	**Optical Instruments**—Bulletin 188-53 describes new Gaertner coordinate cathetometers. (Page 164)
A-1-64	George Gorton Machine Co.	**Mills**—Bulletin 2699-A-2601 describes Gorton Mastermil. (Page 64)
A-1-234	Hannifin Co.	**Cylinders**—Hannifin cylinder file contains data on Hannifin cylinders. (Page 234)
A-1-IFC	The Heald Machine Co.	**Grinder**—Bulletin 2-161-2 Issue 1 describes Model 161 Rotary Surface Grinder. (Inside Front Cover)
A-1-184	Cutter Division The Ingersoll Milling Machine Co.	**Cutting Tools**—Catalog 66F describes Ingersoll inserted blade milling and boring tools. (Page 184)

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Literature Number	COMPANY	DESCRIPTION
A-1-230-1	Louis Levin & Son, Inc.	**Lathes**—Catalog "M" describes line of instrument lathes, microdrilling equipment and accessories. (Page 230)
A-1-235	F. J. Littell Machine Co.	**Special Machines**—Catalog 56 gives details on the Littell line of roll feeds, wheels, straightening and feeding machines. (Page 235)
A-1-62	Macklin Co.	**Grinding Wheels**—Macklin B-20 resinoid snagging wheels described in Bulletin B-20. (Page 62)
A-1-218	Metal Carbides Corp.	**Cutting Tools**—Catalog 57-G contains data on Talide metal carbides. (Page 218)
A-1-233	Mohawk Tools, Inc.	**Cutting Tools**—Brochure gives engineering details on Sublands vs. Step tool operations. (Page 233)
A-1-9	National Broach & Machine Co.	**Cutting Tools**—Red Ring gear shaving cutters described in Bulletin CR-56-10. (Page 9)
A-1-31	National Tool Co.	**Cutting Tools**—Catalog shows line of special tools for the metalworking industry. (Page 31)
A-1-35	Niagara Machine & Tool Works	**Presses**—Niagara automatic presses described in Bulletin 284. (Pages 34-35)
A-1-178	Oakite Products, Inc.	**Metal Cleaning**—Engineering applications described in Booklet, "Some Good Things to Know About Metal Cleaning." (Page 178)
A-1-21	The Ohio Crankshaft Co.	**Induction Heating**—Catalog shows "Typical Results of TOCCO Induction Heating for Forging and Forming." (Page 21)
A-1-48	Pines Engineering Co., Inc.	**Special Machines**—Booklets contain data on case histories of production bending. (Page 48)
A-1-47	The Producto Machine Co.	**Die Sets**—Catalog No. 11 simplifies ordering and selection and Die Set Digest gives tips for engineers and users of dies. (Page 47)
A-1-189	Reed Rolled Thread Die Co.	**Thread Rolling**—Attachment application Booklet B-1 describes Reed thread-rolling attachments. (Page 189)
A-1-52	Rivett, Inc.	**Valves**—Catalog 204 gives circuit design drawings, specifications, cutaway views, tables, and diagrams of Rivett valves with floating pistons. (Page 52)
A-1-158	Rockford Clutch Div. Borg-Warner	**Clutches**—Bulletin shows typical installation of Rockford clutches and power take-offs. (Page 158)
A-1-193	Seibert & Sons, Inc.	**Special Tools**—Folio 2-50 describes Seibert's line of holding and driving tools. (Page 193)
A-1-213	Seneca Falls Machine Co.	**Special Machines**—Booklet shows tooling layouts for production machining and multiple tool turning. (Page 213)
A-1-172	Speedgrip Chuck, Div. of Ernest, Holdeman & Collet, Inc.	**Locators**—Speedgrip expanding locators described in Bulletin No. 24. (Page 172)
A-1-248-2	P. A. Sturtevant Co.	**Measurement**—Inch-pound torque models and larger foot-pound ranges described in torque manual. (Page 248)
A-1-244-2	Unitron Instrument Div. United Scientific Co.	**Microscopes**—Bulletin TM describes Unitron's combination toolmakers and metallurgical microscope. (Page 244)
A-1-226	United States Drill Head Co.	**Machine Attachments**—Adjustable U. S. Drill Heads described in Catalog No. AD-57. (Page 226)
A-1-246	U. S. Tool Co., Inc.	**Special Machine**—Bulletin 15-T gives engineering data on U. S. Multi-slides. (Page 246)
A-1-216-3	The Vaill Engineering Co.	**Special Machines**—Bulletin T-1 describes Vaill tube end-forming machines. (Page 216)
A-1-28	The Van Keuren Co.	**Precision Lapping**—Catalog and Handbook No. 36 contain technical and engineering information on measuring problems and methods. (Page 28)
A-1-257-3	Veet Industries	**Radial Drills**—Veet line of special equipment described in brochure. (Page 257)
A-1-186-1	Wilson Mechanical Instrument Div. American Chain & Cable Co.	**Testing**—Wilson Diamond "Brale" penetrators and "Rockwell" hardness testers described in Booklet DH-327. (Page 186)
A-1-208	The Yoder Co.	**Special Machines**—"Multiple Rotary Slitting Lines" described in catalog. (Page 208)
A-1-196	Zagar Inc.	**Drill Heads**—Engineering specifications contained in Manual E-1. (Page 196)

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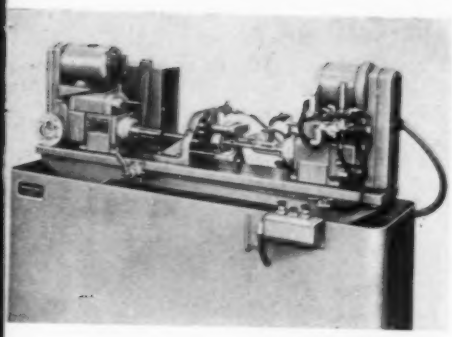
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may be used with a small index table, manual or air clamp fixtures, hopper or vibration feeds, and is available with either manual or automatic interlocked cycle. It is also adaptable to multiple head operations and will perform two operations per hole when fitted with an index table.

Two standard-model 19-150 hydraulic drill units provide a drilling capacity of 5/16-in. diameter in mild steel. Tapping capacity is $\frac{3}{8}$ in. With a maximum stroke of $1\frac{1}{2}$ in., spindle speed range is 300 to 10,000 rpm, with a feed range of 0 to 70 ipm. Rapid approach rate is 350 ipm, rapid return rate, 300 ipm.

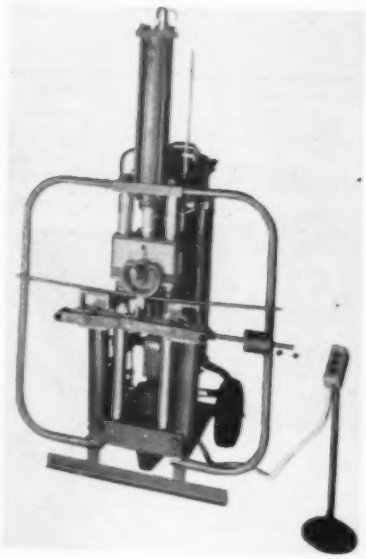
The machines are available completely assembled or as separate components for assembly by the user. The base (equipped with a coolant tank and pump, chip tank and coolant trough) is 40 in. high, 22 in. wide and 65 in. long.

Hartford Special Machinery Co., 287 Homestead, Hartford 5, Conn.

T-1-32

Ram Type Bender

This No. 1402 vertical ram type bender used for press bending requires a floor space of only 100 x 45 in. It bends to 180 deg with no repositioning of dies or relocating of material. It will bend up to 2 in. heavyweight steel pipe in coils, return bends, special curves,



angle irons, channels, reinforcing bars etc. A simple initial setting of the duplicator stop will make an unlimited number of the same bends.

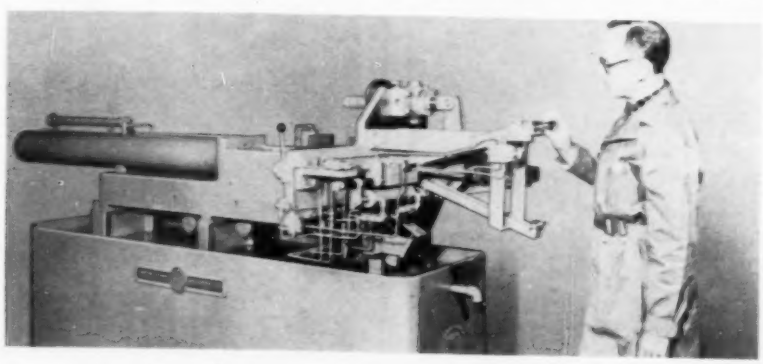
Wallace Supplies Mfg. Co., 1304 Diversey Pkwy., Chicago 14, Ill.

T-1-33

Air-Powered Broaching Fixture

Fully-automatic loading is provided with this Red Ring air-powered broaching fixture. All motions in the fixture are operated by air cylinders. Cycle sequencing controls are pilot air valves.

The model illustrated broaches $\frac{1}{2}$-in. wide flats on the ends of 5-in. long steel shafts of two different electric rotor assemblies at a production rate of 720 pieces per hour. Automatic loading is provided by a magazine feed having three separate air-operating cylinders. Broach advance and return is controlled by a 6-in. diam, 25-in. stroke, air-hydraulic cylinder mounted on the end of the fixture. The fixture, loader and broach cylinder unit are mounted on a welded steel base that is provided



L·I has a REAMER SET for every purpose, plant or pocketbook

HELICAL DIE MAKERS
½" taper per foot, and .006 per inch. High speed steel reamers with a high helix angle for machine reaming.

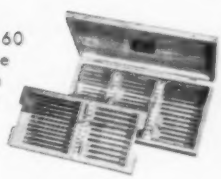


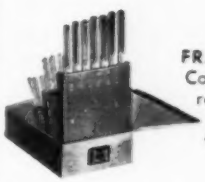


TAPER PIN
¼" taper per foot. Designed for machine or hand reaming standard taper pin holes.

DOWEL PIN
For machine reaming standard dowel pin holes. Sets from ⅛" thru ½".

WIRE GAGE
Wide range of 60 reamers for wire gage sizes from (.2280) #1 thru (.0400) #60.





FRACTIONAL SIZE
Complete range for reaming fractional size holes. Sets from ⅛" thru ½" by 64ths.

Other sets include: Letter size, Over & Under Size and Drill & Reamer Blanks. 34 sets in straight or spiral flutes to choose from, plus 8 combinations of drill and reamer blank sets.

L&I

"the reamer specialists"

LAVALLEE & IDE, INC.

CHICOPEE, MASS.
INDICATE A-1-171

with integral coolant troughs. A motorized coolant pump is provided with the fixture.

Provision for handling the two different parts is made by interchangeable clamping jaws, support jaws and broach holders.

Normally, all operations of the fixture take place within a 5-second operating cycle.

Standard air valves and cylinders are used throughout the fixture design. An emergency dump valve permits a pushbutton control to stop the cycle sequence at any point. Cycle start and stop pushbutton controls are also provided for operating the fixture, which occupies a floor space 40-in. by 140-in., and is 60-in. high.

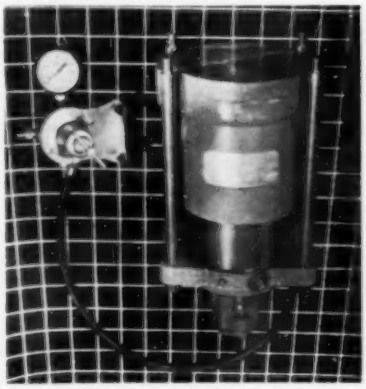
National Broach & Machine Co., 5600 St. Jean Ave., Detroit 13, Mich.

T-1-34

Die Cushion

Universal pneumatic die cushion can be applied to all power presses for all deep-drawing requirements. It also can be adapted to pressure pad control on all forming dies, ejection requirements and other details on die design.

The die cushion, which is of all steel



construction, is made in sizes from 4 to 8 in., with ring holding pressures from ½ to 900 ton, developed from the average shop airline pressure.

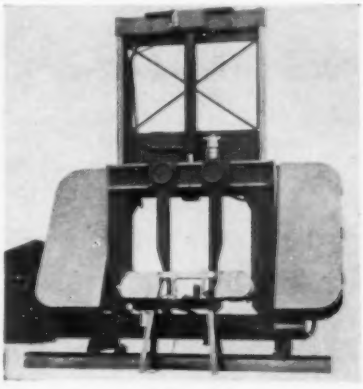
Dayton Rogers Mfg. Co., 2824 Thirteenth Ave., South, Minneapolis 7, Minn.

T-1-35

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Horizontal and Saw

This horizontal band saw, 122 in. wide, and 122 in. high, cuts a 24-in. round carbon log in less than one min-



ute. Designated special model J-38, it will cut up to 40-in. rounds.

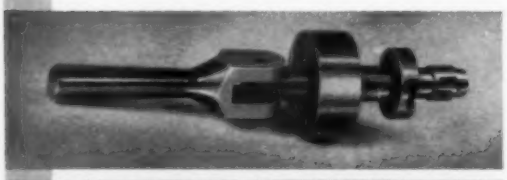
The 1¼-in. blade is driven on four wheels at variable speeds from 300 to 2300 fpm. The cutting head is raised hydraulically on rollers to minimize friction and give a steady feed. The saw

Add accuracy to your work—with

SPEEDGRIP
EXPANDING LOCATORS
Outmode Solid Pin Locators

In loading or unloading work from fixtures, with Speedgrip Expanding Locators you can obtain location tolerances within .0002".

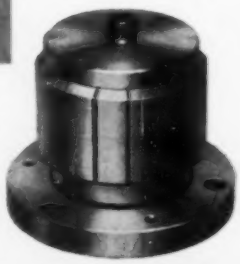
- Guaranteed to repeat fixture location accurately.
- Assures easier loading and unloading of work.



#0 Speedgrip Locator with cam lever actuation. With corresponding bushings, this locator will accommodate bores from ⅛" to ¾" dia.



#2 Locator with hand knob actuation. With expansible bushings, this locator can be used for bores from 1" to 2" dia.



This #5 locator can be supplied for either wrench or draw bar actuation. Has precision ground pilot on under side of flange for mounting to fixture. With expansible bushings this locator can accommodate bores ranging in size from 5" to 11" dia. Locators, with various means of actuation can accommodate bores, ranging from ⅜" to 11".

Write for Bulletin No. 24 for detailed description.

SPEEDGRIP CHUCK
Division of ERNEST, HOLDEMAN & COLLET, INC.
Elkhart, Indiana

SOME OPEN TERRITORY

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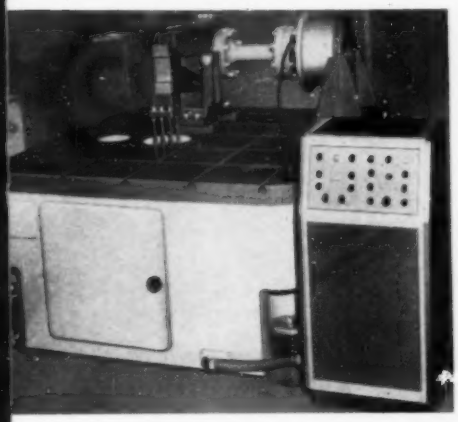
can be built to meet individual specifications and with other speeds. In the illustration, a standard model is shown with the special model J-38.

W. F. Wells & Sons, Three Rivers, Mich **T-1-36**

Fatigue Testers

Fatigue-testing machines provide both high force and high amplitude loading stations, permit testing at both room and high temperatures and require no special foundations.

The machines can test specimens under loads ranging from 50 lb. lowest capacity in the smallest machine, to

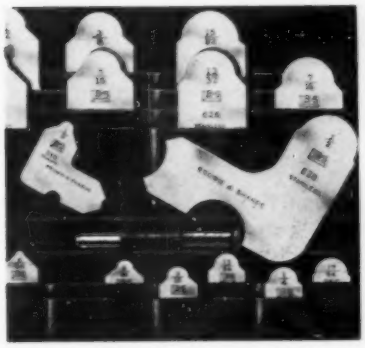


120,000 lb. highest capacity of the largest. Through the use of multiplying fixtures, the capacities of each machine can be increased five times—thus top capacity of the largest machine becomes 600,000 lb.

Electronics and Instrumentation Div., Baldwin Lima Hamilton Corp., Waltham, Mass. **T-1-37**

Radius Gages

Series of gages provides easy, precise way of checking radii from 1/32 to 1/2 in. Each of these No. 628 radius gages has five different gaging edges, permitting testing of both convex and concave radii even when recessed, and facilitating the testing of corner radii. Gages are stainless steel, furnished with interchangeable holders.

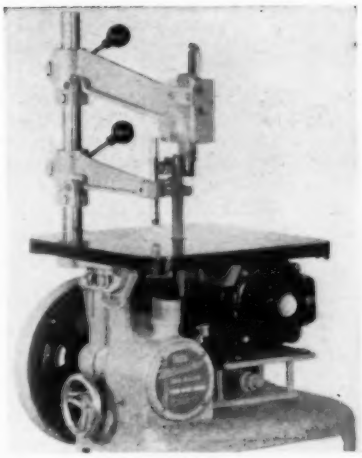


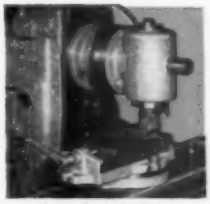
The gages are available in three sets: 1/32 to 17/64 in. by 64ths, 9/32 to 1/2 in. by 32nds, and a combined set of both ranges. Individual sizes also are available singly.

Brown & Sharpe Mfg. Co., Providence, R. I. **T-1-38**

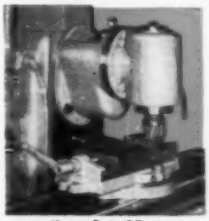
Die Filer

Model FS-VSS die filer has infinitely adjustable speed and stroke lengths. Through simple adjustment of two controls, speed may be varied from 100 to 475 strokes per minute and stroke length may be adjusted from 0





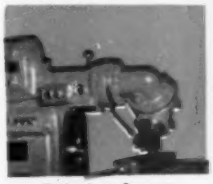
Heavy Duty Vertical Milling Attachment



Heavy Duty Offset Vertical Milling Attachment



Universal Milling Attachment



Toolmakers Overarm

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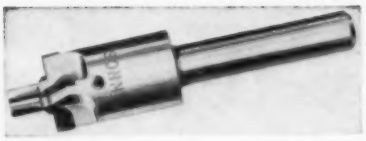
to 2 in. Offset upper and lower chucks of ball jointed construction provide fast chucking and easy alignment of files.

The equipment also offers swinging overarms, choice of three sizes or 4-way tilting tables, and a means for instantly zeroing the tables.

Rice Pump & Machine Co., Belgium, Wis. **T-1-39**

Port Contour Cutters

Heavy-duty port contour cutters produce the AND 10050 hydraulic port contour in all types of steel in a single pass. When a reamer pilot is used, the



cutter also sizes the minor diameter of the Class 3 thread specifications.

An opposed flute design is utilized to reduce radial pressure. A slightly positive axial rake results in shear like cutting action, preventing build-up on the cutting edges and reducing cutting pressures.

Shank and body of the tool available in 13 diameters for all sizes of fittings used with ⅛ through 2-in. diameter tubing, are made of hardened alloy steel; cutting edges are tipped with tungsten carbide. The cutter is available with replaceable plain pilots or reamer pilots. As an optional feature, the tool can be provided with carbide wear strips ground to a precision tolerance so the tool can be fed through a bushing for extra stability.

Sonnet Tool & Mfg. Co., 576 N. Prairie Ave., Hawthorne, Calif. **T-1-40**

Solenoid

Rated to 6000 psi, and designed for use with any media, this two-way stainless steel solenoid can be used to control high-pressure corrosive gases and fluids. The valve designated Series 2000, is a direct-lift type, available in



⅛, ¼, ⅜ and ½ in. pipe sizes. Port sizes depend on maximum pressures and viscosity of media. The valve can be supplied with an explosion-proof housing.

Atkomatic Valve Co., Inc., 545 W. Abbott St., Indianapolis 25, Ind. **T-1-41**

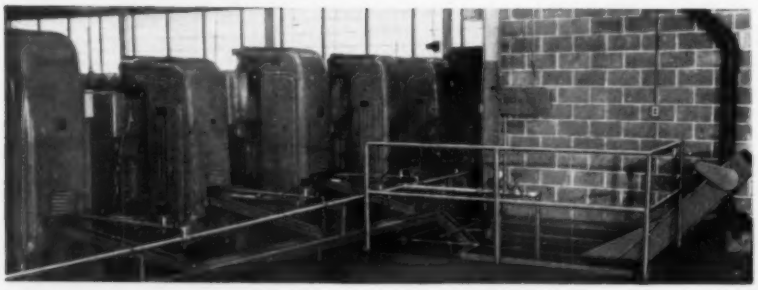
Speed Testers for Saws and Wheels

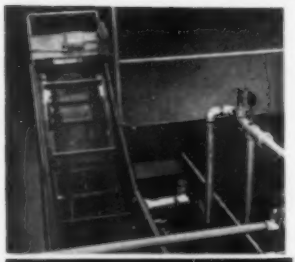
Full automatic models load and unload wheels automatically; semiautomatic models require manual loading and unloading.

The machines make it possible to preset testing speeds up to 15,000 rpm with smooth rapid acceleration and



Fairfield Manufacturing*
*LAFAYETTE, INDIANA
Improves Gear Finish, Reduces Costs with the
Delpark Filter-Matic
VACUUM FILTER





The heavy viscosity of cutting oils has always created problems where filtration was required on high flow rates. The fluidity of the oil itself often defeated the method, but on gear shaving production the metal fines borne in the spent oil added even greater difficulties.

Delpark's Filter-Matic Central System at Fairfield serves 10 Gear Shavers with a combined flow requirement of 30 g.p.m. To allow for future addition and expansion, a 60 g.p.m. Filter-Matic was installed.

Fairfield has benefited several ways through the Delpark Filter. Gear finish has been improved, machine productivity has been increased and maintenance time reduced.

The Delpark Filter-Matic can save you time and money in filtering soluble and cutting oil on your machining operations. A Delpark representative can give you the complete story.

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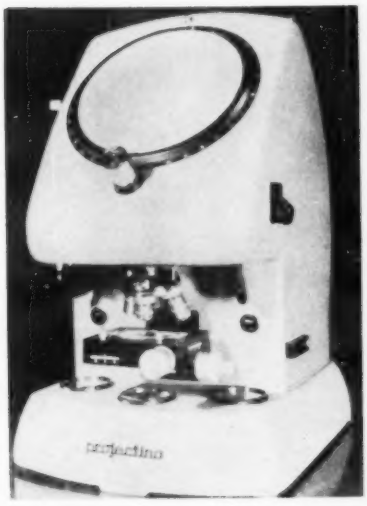
deceleration. Standard models handle wheels up to 4 in. thick and 20 in. diameter. Larger sized wheels are handled by other models. According to inertia of wheel, three to six wheels can be individually tested per minute. Test speeds are selected, preset and indicated on a central control panel. Wheel under test spins in heavy steel enclosure, and interlocking controls prevent rotation of wheel outside the safety housing.

George L. Day Co., Inc., 1227-1231 Niagara St., Buffalo 13, N. Y. **T-1-42**

USE READER SERVICE CARD ON PAGE 169 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Multipurpose Optical Tester

This Swiss optical tool, called the Projectina, is a portable, microscope-projector-comparator-camera. Designed for rapid interchange of optics and photographic equipment, the unit can be fitted with a simple adapter on the observation face of the instrument; any image previously projected on the screen in the magnification range 7x to



2000x may instantly be photo-recorded with either the Graflok back or Polaroid Land back in black and white or color. Micro pictures may be seen on an effective 7-in. ground glass screen and also through the eye piece at a constant scale without refocusing. Built-in illuminators allow for microscopy and projection in transmitted bright and dark-field as well as surface bright and dark-field. The light intensity is variable by finger-tip control.

Also incorporated are stationary stages for large specimens, mechanical stages with vernier reading of 1/10 mm, and high precision mechanical stages that permit the reading of 1/1000 mm on the measuring knobs. The screen is located and inclined so that it will be on a natural level of vision with the operator in sitting position. Standard screen are offered in a choice of eight variations from plain to vernier or angular reference lines. All screens interchange readily and always maintain exact magnification.

Alfred Hofmann & Co., 629-635 Fifty-Ninth St., West New York, N. J. **T-1-43**

Wet Surface Grinder

The Lempco No. 545 automatic wet surface grinder is available in four bed sizes to handle 11½ x 38, 62, 86 and





FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-1-175

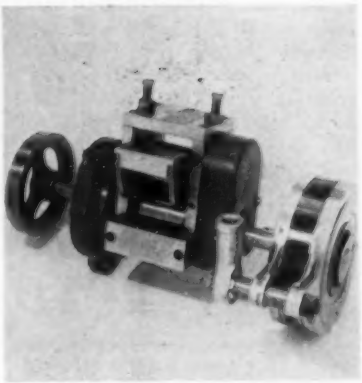
110-in. work. In addition two types of grinding wheel traverse may be ordered: G Models have a constant traverse of 45 ipm, and E Models offer an infinitely adjustable traverse permitting speeds from 0 to 42 ipm.

Optional features include magnetic chucks, automatic downfeed (with or without automatic stop), multiple wheelheads, trunnioned chucks and special bed designs.

Machine & Tool Div., Lempco Industrial, Inc., Bedford, Ohio. **T-1-44**

Roll Feeds

Features added to line of roll feeds include larger handwheel which facilitates starting of material through the rolls, and a special ratchet brake which makes brake adjustment easy and feeding accurate. Rolls are supplied either hardened and ground or knurled. A special tool steel is used in the ratchets of the Selectomatic indexer on the roll feeds to minimize wear and give long life. Top roll tension springs are designed for long life and to give broad top roll adjustment for thick materials.



Durant Tool Supply Co., 1-15 Thurbers Ave., Providence 5, R. I. **T-1-45**



FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-1-176

Hydraulic Circuit Tester

Model PT-100-B portable oil hydraulic circuit tester is quickly connected by hose to the component part to be tested and to a low pressure return line to measure temperature, volume and pressure to locate a faulty hydraulic pump, valve or circuit.



General specifications of the 19-lb unit are: porting, 1-in.; pressure range, 300 to 500 psi; maximum flow, 100 gpm (scale ranges from 0-25, 12-50, 32-100); temperature gage of 60 to 220 F.

Schroeder Brothers Corp., McKees Rocks, Pa. **T-1-46**

Lock Washer Feeder

Noninterlocking spring type lock washers can be oriented through an escapement track direct to a desired application by this feeding device. Track travel upwards of 40 fpm will attain a feeding rate in excess of 15,000 parts per hour. Lock washer sizes from ⅛ to



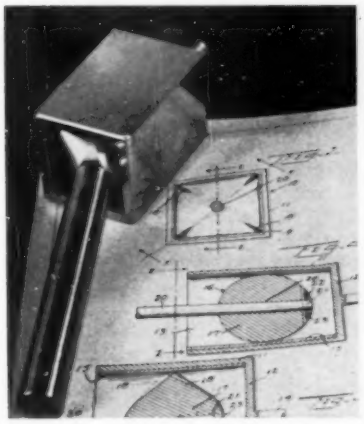
⅞ in. have been successfully hopper fed. For larger sizes, size of the bowl and drive units are increased. By this feeding development, the lock washer split can be positioned on the top or on the side or trailing. Connector track to the point of application can be designed for vertical or horizontal delivery.

Perry Equipment & Engineering Co., Div. of Automatic Devices, Inc., 3125 Brandes St., Erie, Pa. **T-1-47**

Universal Joint

This universal joint is an efficient, simple coupling for use in applications involving at least 6,000 rpm with little friction and good alignment. Under test on a router, the joint had a no load speed of 20,000 rpm.

The joint consists of a square female

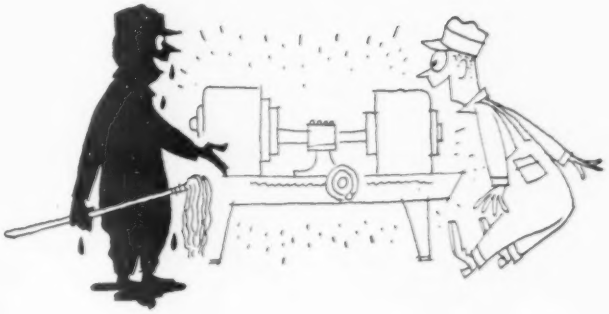


member or housing while a head of metal or plastic with an extended shaft comprises the male member. The head is a combination of two basic forms: a cylinder and right angle cone. Actually, four right angle cones are formed so that the resultant shape can turn diagonally in the square housing.

Size of the joints, which operate without much heating, may vary to suit the application. Ordinarily the joint should be twice the size of the

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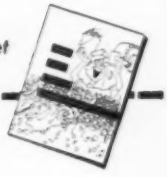
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shaft. For a fastening joint, the ratio between shaft and joint should be 5:8 or 3:4. Should the joint wear and become loose in the housing, it will still hold the shaft on center.

Available from the inventors, A. M. and I. S. Kvalheim, 34 Park Ave., Petaluma, Calif. **T-1-48**

USE READER SERVICE CARD ON PAGE 169 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

High Pressure Valves

Solenoids are enclosed in Crouse Hinds housings in these valves, which are rated for oil and water pressures from 0 to 250, 0 to 1500, 0 to 3000 psi, and air pressures 0 to 250, 0 to 1000, 0 to 1500 psi. They come in four-way, three-way, shutoff and diverter flow patterns. Standard a-c voltages are 110, 220 and 440 volts. Shear-Seal design provides for a sealing ring in constant intimate contact with a mating slide. The metal-to-metal sealing surfaces continue to lap themselves with each operation thus maintaining their sealing qualities.



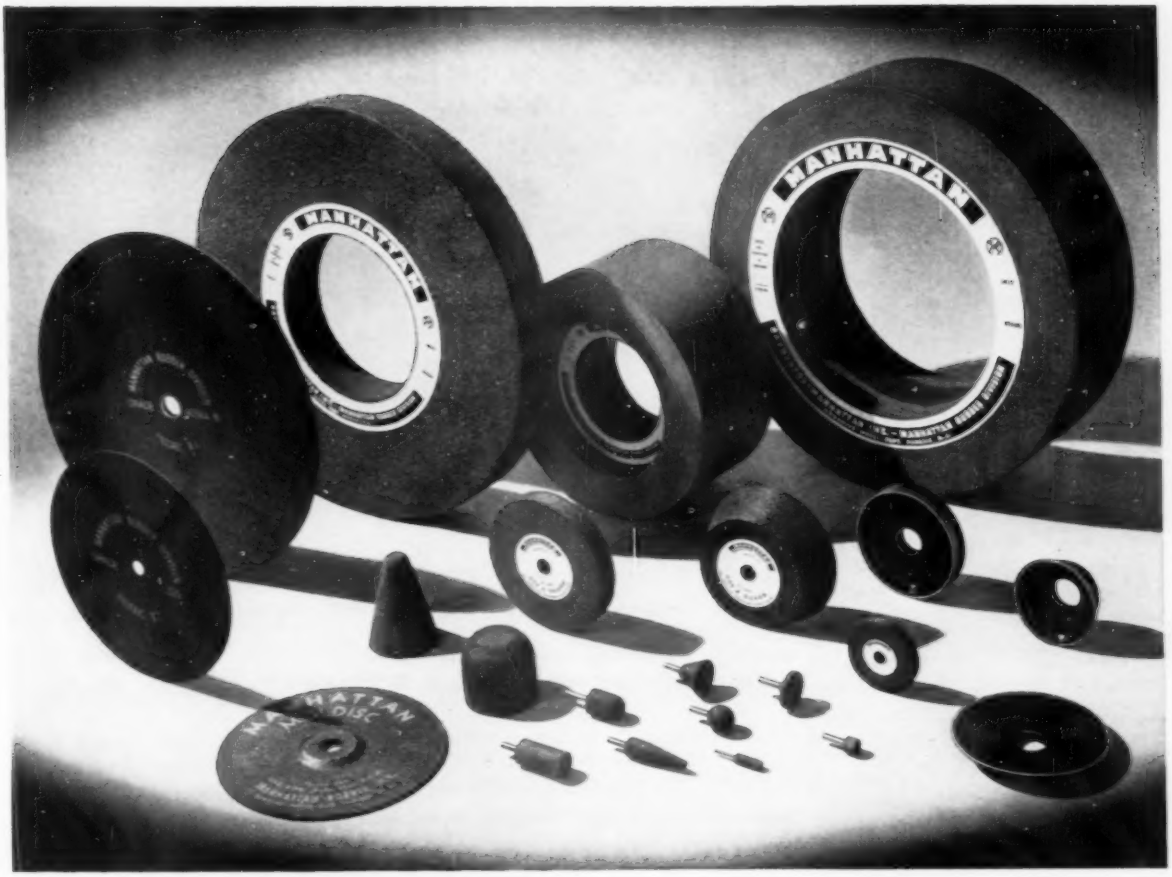
Barksdale Valves, 5125 Alcoa Ave., Los Angeles 58, Calif. **T-1-49**

Worms and Wheels

Line of type Q precision worms and wheels are available from stock. Worms are made of stainless steel while the wheels are made of bronze. They are available in 48 pitch in single, double or quadruple threads.

The small pitch diameter worm makes these worm and wheel combinations suitable for miniature programs and high ratio reduction.

Pic Design Corp., subsidiary of Benrus Watch Co., Inc., 477 Atlantic Ave., East Rockaway, N. Y. **T-1-50**



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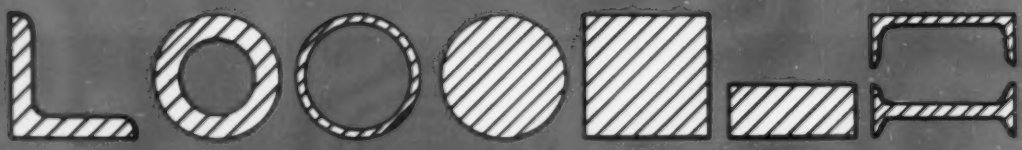
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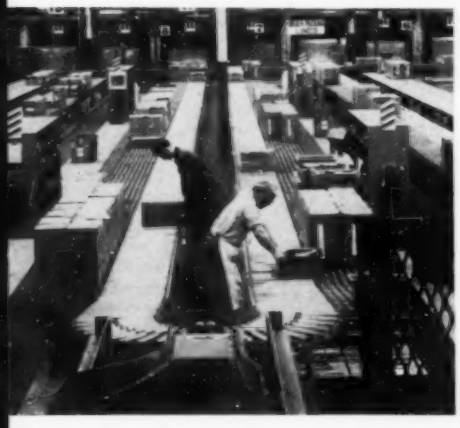
PROGRESS IN PRODUCTION

MECHANIZED WAREHOUSE RUSHES BEARING SHIPMENTS

An unusual approach to inventory control, production scheduling, storage, and processing of customer orders has been initiated at The Timken Roller Bearing Co.'s Bucyrus plant. The new Shipping Center now handles about 95 percent of Timken's bearing shipments. Each month more than 10-million pieces are handled and shipped by the packaging and handling equipment in the highly mechanized warehouse.

In the plant, 11 production lines operate much like a high precision machine. Approximately 12 to 15-million cups and cones—about a month's supply—are kept in stock at all times. Actually a total of 14 cups and cones constitute 80 percent of the production volume. As a result of high degree of standardization of bearings for automotive applications, lightweight high capacity bearings, and the high rate of efficient production, economies have been possible that have permitted a set of bearings for low and medium priced 1957 cars to cost less than in 1953 in spite of higher labor and material costs.

During the midnight shift, bench loaders arrange products on the packing benches. Orders will be packed and shipped during second and third shifts.



An important tool in the inventory system is an automatic computer located in the company's Canton, Ohio office. Its major task is to keep track of inventory scheduled production and unshipped customer orders. Thus it is easy to determine quickly whether or not a customer's shipping date request can be met. An integrated data processing system permits records to be made in such a way that other related records can be made from it with maximum use of machines and minimum manual effort. Where each manufacturing plant formerly had its own shipping department and received the orders or partial orders involving its particular output, customers received shipments in at random from the several plants. If one order was late, the company customer's entire production might be held up until the pieces arrived. Such problems are avoided with the new Shipping Center—the entire order now is shipped from one location.

To accomplish the more efficient work, products are received and stored by a system of conveyors, lift trucks and special equipment. Parts are delivered regularly to the Center from various production plants, and are stored in an area divided into three sections for pallet, box and bin lots. All material passes the IBM key punch operator who controls the pallet unloader and conveyors that lead to the storage areas. During the midnight shift, bench loaders arrange the product from the storage area on packing benches. These 16 benches are 100 ft long and are divided into four parts making a total of 64 packing stations.

HOT SPINNING TITANIUM NETS PRODUCTION ECONOMY

Advanced process for hot-spinning thick titanium alloy hemispheres by methods suitable for economic production quantities was developed by Titanium Fabricators Inc. which also designed and constructed special machines to do the job, as part of a contract from Convair Div. of General Dynamics Corp. Problem was to make pressure vessels of the lightest possible weight for missile applications. To get the most gas into the lightest container, manufacturers in the past have either used low strength, light weight materials like fibers, or heavy strong materials like steel.

This time, engineers approached the problem by making heat-treated titanium bottles, since relatively heavy walled vessels are required, and heat-treat problems are increased. They used 6A1 4V titanium alloy, a relatively new heat-treatable alloy, originally developed by U. S. Army Ordnance. For forming hemispheres, circular blanks were used, delivered in plate form from the mill. The blank is preheated in a large preheat furnace, and then hot spun. Spinning is considered more economical and more easily controllable than deep drawing. As a result, finished spherical vessels are being produced with 16, 22,

CRAFTS

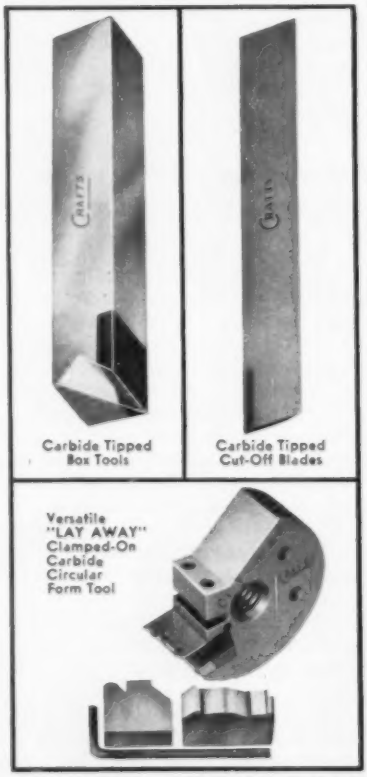
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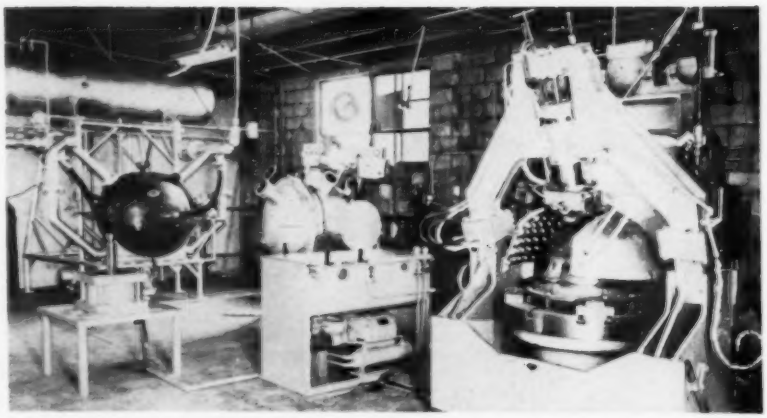


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INDICATE A-1-182



Partial view of pressure vessel shop shows the vertical spinning machine at right; heat-treat chamber, in which vessels are heated in vacuum and quenched, at far left, and a special small hydraulic press, which puts the first contours on top of the plates, in the left foreground. The weld chamber is in the center. All units were TIFAB designed.

and 25-in. diameters.

The vertical spinning machine was designed under the direction of Dr. Morris Asimov. Completely hydraulic, the machine permits controllable feeds, speeds and pressures. It is essential to control hot forming with titanium alloys, particularly in this application.

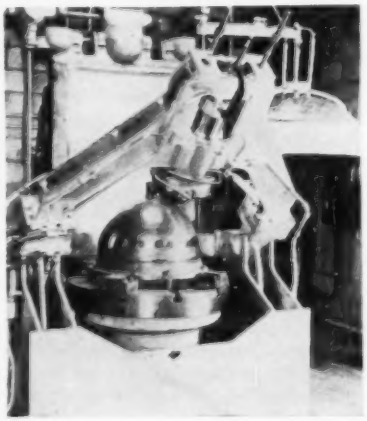
The vertical spinning machine is a special vertical spinning lathe frame with a floor-mounted table rotating in the horizontal plane. A specially designed hydraulic yoke moves up and down on an axis of the great circle of the hemisphere. The hydraulic system is practical because titanium should be formed slowly, and by the high but controlled pressures. Because of its hydraulic system this machine can exert as much as 12 ton of pressure on the small area being formed. The hydraulic system is rated at 3000 psi.

As an example of the machine's adaptability, it usually is necessary to scarf or machine edges of the hemispheres after final spinning. This can readily be done by an easily mounted special attachment. Thickness can be closely controlled during spinning. However, for contour machining, the spinning tool is simply removed from the machine, and the machining tool attached.

In order to weld titanium by vacuum or inert gas, the engineers designed a special welding machine. Hand welding is inconsistent and may result in excessive contamination. In TIFAB's welding process, the entire vessel is submerged in inert atmosphere to prevent contamination. The hemispheres are welded semiautomatically insofar as is feasible.

The pressure vessels are then heat treated in a special quench chamber so that they are quenched rapidly and evenly with minimum distortion. The vessel is inserted into a special vacuum chamber at room temperature and heated. Water under pressure is then sprayed to hit all points on the vessel instantly and evenly.

Blank is shown in vertical spinning machine, following preheating.



DEVELOP EASY TECHNIQUE FOR GUNDRILL SHARPENING

An inexpensive means for sharpening gundrills and tube reamers is beating an old problem confronting users of such tools. This sharpening operation in some plants has brought into use expensive or elaborate instruments to check sharpening accuracy. In other plants, partly worn drills are simply discarded because toolroom personnel do not want to go through the troublesome procedure for measuring accurate sharpening.

To overcome this problem, engineers at Eldorado Tool & Mfg. Corp. developed a simple sight gage that permits



The sight gage is held for completion of the milling process. View shows rear side of gage.

a quick and precisely accurate check of the sharpening operation. Simplicity of the device as well as its inexpensiveness has prompted the company to offer the information as a service rather than develop it as a manufacturing item.

Once the proper technique has been mastered, gundrills can be considered particularly easy to sharpen. There are but two cutting edges—an inner and outer nose angle—that require sharpening; and these can be sharpened several times before a complete nose regrind is necessary.

When angles best suited for the specific setup and materials have been determined, the user is ready to make a "sight" gage. A gage for every drill diameter is required.

These are details of the procedure:

1. Any piece of screw stock, which is at least four drill diameters long, may be used.

2. Stock is gundrilled 3½ diameters deep or twist drilled and bored to gundrill size, 3 diameters deep on a lathe. Next, tailstock is gundrilled; carefully feed into the drill just enough to bottom the hole. This forms the profile of the gundrill. A light feed and ample cutting fluid are essential.

3. Blind end is milled to center line of the hole (axis) in front. Then enough stock on the back side is milled away to leave 1/16 to 1/8 thickness of the sight-blade. Depth of location of this step will be the maximum tolerance for the oil clearance shoulder. To position the gundrill in the gage correctly, the flat surface of the drill is held flush with the front of the gage. Viewed from the front, this provides a sight gage for both angles; viewed from the rear, it is a gage for checking clearance and the inner angle.

4. Burrs should be removed and markings inscribed on gage front, rear, and minimum tolerance for oil clearance shoulder.

Four steps also are involved to resharpening the gundrill or tube reamer.

1. Correct oil clearance step with minimum of 0.030-in. tolerance.

2. Grind inner angle, using rear view of gage. Check angle through opening.

3. Grind outer angle, using front view of gage. Check for angle accuracy and location by holding the drill flush with front surface of gage.

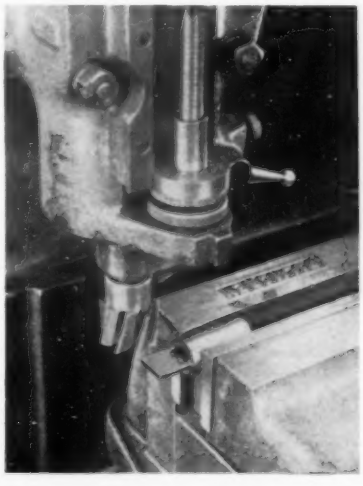
4. Chamfer 1/64 x 45 deg from top of shoulder to bottom of secondary clearance of outer angle.

All of these clearances can be viewed through the rear of sight gage. Unless the gundrills are very large, no secondary clearance is needed for the inner angle. Primary clearance land should be not more than 1/64 on small drills.

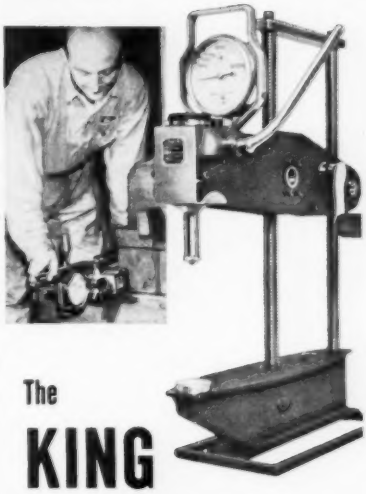
The only parts of a gundrill or tube reamer type gundrill which have been discussed can be touched up without ruining the tool. The only effect, for example, of different relationships of nose angles to each other will be to form a different shape of chip. The determining factor for resharpening is the width of the wearland. Amounts to be ground off depend on the damage to be removed at the outer corner of the outer angle. Gundrills can be sharpened until there is practically no carbide left, or, in the case of inserted carbide tips, until the radius in back of the cutter meets the center line of the tool. At 0.005 in. per sharpening, a 1-in. (useable) length of tool amounts to approximately 200 sharpenings.

Diamond wheels of 180 to 320 grit appear to give best efficiency.

A gundrill sharpened tip is checked with the gage. If light shows between tip and gage impression, sharpening is required.



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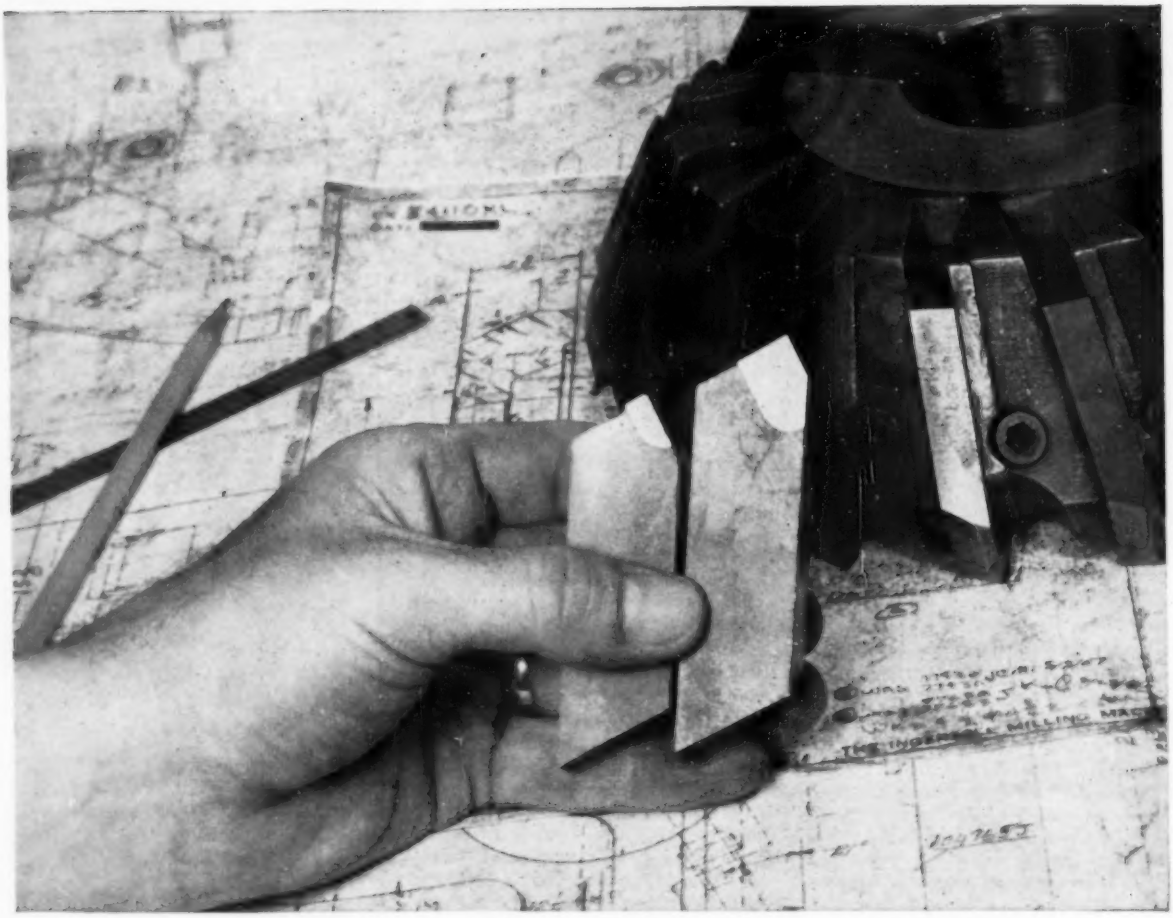
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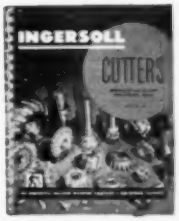
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FIELD notes

A two-year technical program in foundry work may be added at Western Michigan University. The plan, which would emphasize laboratory and theory aspects, and extend into both ferrous and nonferrous phases, is currently being studied by an industry advisory committee and the school's department of industrial technology. Kalamazoo, in which the Michigan school is located, is considered an appropriate center for such technical study because of its proximity to 212 foundries which would provide ample background for all types of foundry work.

v v v

Production engineers and manufacturing personnel of customers of Duramic Products Div. of Technion Design & Mfg. Co., Inc. are being offered a free course on the best methods for using high temperature ceramic tooling. The course deals with how to correctly design ceramic tooling; how to machine ceramic tooling; how to make low cost case ceramic tools; and how to correctly fasten ceramics.

acquisitions

Crucible Steel Co. of America has acquired total ownership of Rem-Cru Titanium Inc. by an exchange of 150,000 shares of Crucible common stock for the entire half interest owned by Remington Arms Co. The acquisition gives Crucible the facilities for producing titanium and vacuum arc-melted steel products.

v v v

Lines of metal forming and work handling machinery formerly built by Struthers-Wells Corp. have been purchased by The Taylor-Winfield Corp. The acquisiton permits Taylor-Winfield to design and build coordinated production lines to process coil or strip through to the finished welded product. The company also will manufacture individual metal forming machines and provide repair, redesign and replacement service for metal forming and work handling equipment previously made by Struther-Wells. Key personnel of this Struther-Wells activity have entered Taylor-Winfield employ and will continue to design, sell and service the specialized line of equipment.

v v v

Acquisition of Spinform, Inc. has been completed by Pantex Mfg. Corp. No change of personnel in either company is presently contemplated except for necessary staff additions.

v v v

The Carpenter Steel Co. has taken over the former Northeastern Steel Corp. which became a wholly owned subsidiary of Carpenter. The acquired firm, now known as Carpenter Steel of New England, Inc., with its additional steel making facilities will result in a combined annual production capacity of 170,600 ingot tons.

v v v

Mercast Corp. has acquired Gray & Huleguard, Inc. which now will be operated as a subsidiary. According to the announcement, present operations of the firm will be continued and its expansion accelerated.

v v v

King-Seeley Corp. has purchased Queen Products and its associated company, the Albert Lea Building Corp.

new activities

H. Neuman & Co. have instituted a new service whereby potential users of timing belts can try the drives on their own products without having to make experimental pulleys. Pulleys from 10 to 60 grooves in ¼-in. pitch are stocked. All are made from aluminum, and some sizes are made from steel.

v v v

Activities in the process instruments field are being expanded by Daystrom, Inc. whihch has now formed the Daystrom-Weston Industrial Div. The new division, which will be part of the Daystrom Controlonics Group, will centralize the company's efforts in the process instrumentation field by including production of industrial instruments now located at Daystrom Electric, and the recorder-controller activities of Weston Electrical Instrument Corp. Both are to be located in a new building in Poughkeepsie, N. Y.

v v v

Production has been initiated at the new Totonto, Ohio facility of Titanium Metals Corp. of America. Considered the first facility devoted exclusively to rolling and forging titanium, the plant provides fully integrated facilities from sponge through forgings, billets and alloy sheet production. Billets and large rounds for jet engine applications currently are being shipped while engineering work continues on installation of sheet mills which are scheduled to be in operation early this year.

expansions

A multimillion dollar expansion and improvement program for the facilities in Chicago Heights is being launched by Calumet Steel Div. of Borg-Warner Corp. It will be divided into two stages —the first will increase capacity by at least 40 percent, improve product quality, broaden the product line, reduce costs and make around-the-clock operation possible. This phase of the plan is scheduled for completion by the end of 1959. Second phase of the program, which is undertaken to broaden the division's market base and add new billet steel products to the line is scheduled to be completed by mid-1961.

v v v

Ground has been broken at Crystal Lake, Ill. for a new 20,000-sq. ft. light manufacturing plant for Lake City, Inc., wholly owned subsidiary of Controls Co. of America. The plant, which will cost an estimated $180,000, is expected to be in operation early in 1958, and will house from 200 to 300 employees.

v v v

A program of factory expansion to provide more floor space for assembly, electrical and hydraulic departments, has been completed for Snyder Tool & Engineering Co. The $80,000 addition represents the second stage of a planned program at the company's main assembly plant in Detroit.

v v v

Larger quarters at 7818 Maplewood Industrial Court, Maplewood, Mo., now house the Ferguson Machine Corp. which formerly was located on the grounds of its parent organization, Universal Match Corp., in Ferguson, Mo. Relocation of the subsidiary will make

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available approximately half the space now required by Universal for expansion of its Armament Div. New construction, now under way, will provide the remainder.

v v v

A new plant for Burgmaster Corp., small tool division, of Burg Tool Mfg. Co., Inc., has been opened at 13226 S. Figueroa St., Gardena, Calif.

v v v

Larger floor space for assembly, electrical and hydraulic departments has been provided for Snyder Tool & Engineering Co. with completion of an $80,000 factory expansion program. The new building addition also will provide more high bay floor space area for assembly of automated machinery.

name change

Permacel-Lepage's Inc. is the new name of The Permacel Tape Corp. According to company announcement, reason for the change was an effort to reflect the increased diversity of the product line.

moves

Sentry Co. is moving into its new office building adjoining the main plant in Foxboro, Mass. By housing offices in a separate building, the company has made considerable space available for expansion of factory facilities.

v v v

Watson-Stillman Press Div. of Farrel-Birmingham Co., Inc. has moved from Roselle, N.J., to 565 Blossom Rd. in Rochester, N.Y.

v v v

The M. A. Ford Co. has moved from 732 W. River St. to 1545 Rockingham Rd., Davenport, Iowa.

v v v

Greenfield Tap and Die Corp. has moved its New York office and warehouse from 15 Warren St. to 32 Worth St. where all operations are on a single floor.

v v v

Electro Metallurgical Co., division of Union Carbide Corp., has moved its sales promotion department to the fourth floor of 535 Fifth Ave., New York City.

v v v

General Machinery Supply Co., veteran firm of almost half a century as a distributor for industrial supplies,

has moved into modern new headquarters at 1680 Fourteenth St., Oakland, Calif. The $150,000 structure provides enlarged area for warehouse and general offices.

v v v

Society of the Plastics Industry, Inc. has moved its headquarters from 44th St. to 250 Park Ave. in New York City.

laboratories

A new applied research laboratory is being established by Crucible Steel Co. of America at the company's Sanderson-Halcomb Works in Syracuse, N. Y. The new laboratory will be under the management of Dr. A. M. Aksoy, who has been chief metallurgist for Vacuum Metals Corp., an operating division of Sanderson-Halcomb. It will be a field research facility operating as an extension of Crucible's central research and development department. Research will center on experimental and developmental nature in the fields of metals melted in air, vacuum, or special atmospheres.

v v v

Two new metallurgical laboratories have been put into operation by Gardner-Denver Co. One will serve the plants located at the company's headquarters in Quincy, Ill., and the other is located at the Keller Tool Div. in Grand Haven, Mich. The Quincy lab, under direction of chief metallurgist Frank Harness, will concentrate on checking incoming bar stock and analyzing nodular iron, castings and forgings produced in the Gardner-Denver foundries. The Grand Haven lab, with Claude Dierdorf as chief metallurgist, is also equipped to analyze physical and chemical properties of steel and cast iron. Equipment in the physical section of the lab will provide information on causes of metal fatigue.

new companies

Formation of the Southeast Machinery Co. to meet expanding industrial activities in Florida has been announced by the company's president George Habicht, Jr. Operations for the new firm have begun at 1525 S. Andrews Ave., Fort Lauderdale, Fla.

v v v

Announcement has been made of an agreement which will lead to the consolidation of Universal-Cyclops Steel Corp., Empire Steel Corp., of Mansfield, Ohio, and Reeves Steel and Mfg. Co. of Dover, Ohio. Outgrowth will be formation of the Empire-Reeves Steel Corp. to operate the Mansfield and



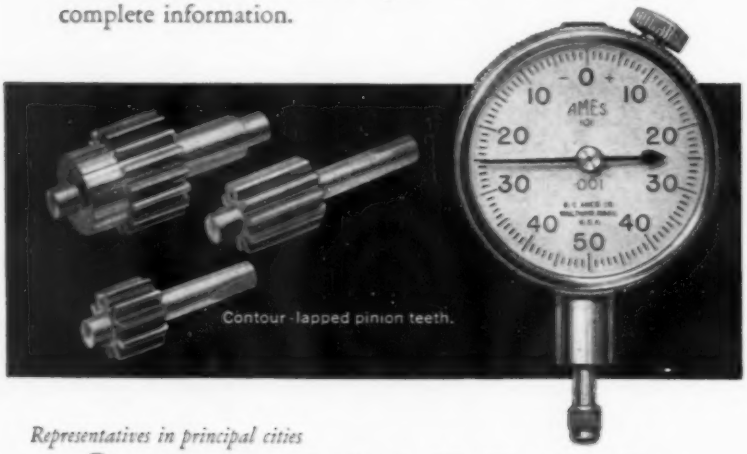
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Dover, Ohio, plants as a wholly owned sibsidiary of Universal-Cyclops. No changes are contemplated in personnel, operation or distribution policies of any of the companies as a result of the consolidation.

v v v

The Index Industrial Corp. has been formed to handle importation and distribution of several lines of heavy machine tools. The new company has established offices at 150 Broadway in New York City.

v v v

The Olivetti Machine Tool Div. of America has been organized to set up distribution, sales, parts and service for the entire line of Olivetti machine tools. Headquarters and show rooms are at 42-33 Northern Blvd., Long Island City. N. Y.

agreements

Brown & Sharpe Mfg. Co. has entered into an agreement with Lipe-Rollway Corp. to sell the latter's automatic magazine loading bar feed for installation on B & S single spindle automatic and hand screw machines. The agreement permits B & S to install, service and maintain Lipe bar feed together with their screw machines anywhere in the United States and Canada.

v v v

The American Pulley Co. has announced a 16-year license agreement with William Kenyon & Sons, Ltd. of Dukinfield, Cheshire, England, for manufacture and sale of American Pulley power transmission products in England for distribution in the British Commonwealth except Canada.

v v v

E. W. Bliss Co. has acquired from American Positive Grip Vise Corp. the patents, trade name, inventory and tools and fixtures for a multifingered vise for gripping irregularly shaped pieces. Bliss will continue to sell the tool under its present name of Ampogrip.

competitions

The 1958 annual mechanical and structural design competition, sponsored by The James F. Lincoln Arc Welding Foundation, is offering $1,250 as top award of the 46 cash prizes. Awards are made in two separate competitions: one for mechanical designs and one for structural designs. The competition is open to undergraduates only, although entries may be submitted after graduation or the close of school. Rules for the competition, which closes

July 1, 1958, are available from the Foundation, Cleveland 17, Ohio.

v v v

Minature Precision Bearings, Inc. has inaugurated an award program designed to recognize outstanding contributions by a company, individual or organization which further the concept of miniaturization. Details for material which will be considered are available from the company, Keene, N.H. Deadline for entries is January 31, 1958.

warehouses

Establishment of a modern warehouse-service center at 5348 Jillson St. in Los Angeles has been announced by Eutectic Welding Alloys Co., Inc. (Pacific Div.) The facility will house complete service, testing, warehousing and shipping space to serve California industry.

v v v

Construction is under way on a new larger warehouse for Latrobe Steel Co. at 1230 Expressway Dr., Toledo, Ohio, to provide stocking of a wider range of steels, bits and rod for the area.

v v v

To meet demand in the Chicago area for specialty tool, stainless and alloy steels, Carpenter Steel Co. has opened a new and larger mill branch warehouse and office which will be midwestern headquarters for both the main company and its Alloy Tube Div.

v v v

Open house marked the opening of a new mill branch warehouse in Houston for The Carpenter Steel Co. The new facility replaces a former sales office.

new offices

The Barden Corp. has set up a new sales and engineering office in Los Angeles at 3850 Wilshire Blvd. to provide direct factory service to aircraft, electronics and other precision industries on the West Coast.

v v v

Wallace Supplies Mfg. Co. now has an office in Los Angeles at 5880 Hollywood Blvd. Arnold H. Johnson, who have been assistant sales manager for the past 11 years, will manage the new office.

v v v

A West Coast regional office has been opened by Datamatic division of Minneapolis-Honeywell at 6620 Telegraph Rd. in Los Angeles. Samuel J. Weigand, recently made West Coast sales manager, heads the new office.

REED RID

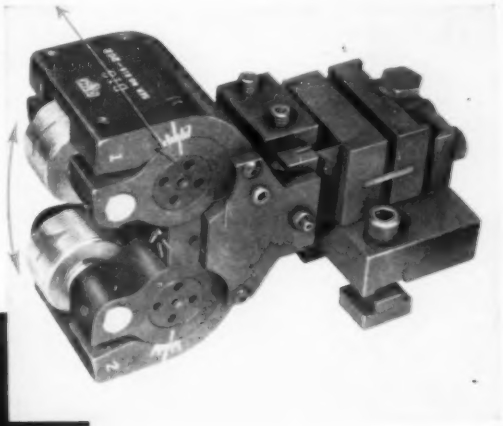
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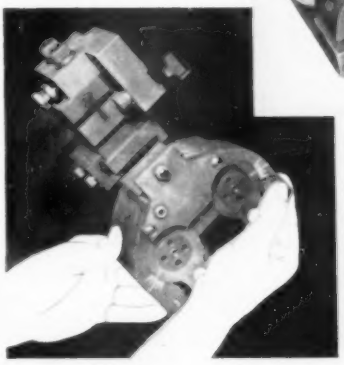
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Men at Work

The board of directors of Huck Mfg. Co. elected **Charles M. Albritton** to the office of vice-president in charge of manufacturing. Until this promotion, he has been plant manager at Huck.

John E. Rowe, formerly vice-president of Ross Operating Valve Co., has been named executive vice-president of Tomkins-Johnson Co.

At the same time, the company announced that **William J. Remund,** who has been sales manager, had been promoted to the post of vice-president in charge of sales.

Edward W. Moffitt was named general manager of the Bridgeport, Conn. plant of Heppenstall Co. He has been with the company since 1955.

Other officers elected by the National Tool & Die Manufacturers Assn. to serve with new President Marsilius, include first vice-president **Jack Kleinoder,** secretary-treasurer of Volkert Stampings, Inc.; second vice-president **Harold G. Murdock,** vice-president of Arrowsmith Tool & Die Corp.; treasurer **Robert C. Renner,** president of the East Dayton Tool & Die Co.; and secretary **James A. Perdy,** vice-president of Atlantic Mfg. Co. Mr. Murdock is a member of ASTE's Los Angeles chapter.

Three vice-presidents and a secretary were recently elected by Allis-Chalmers Mfg. Co. board of directors. New vice-presidents are **P. F. Bauer,** managing director of Allis-Chalmers International; **E. J. Mercer,** general manager of Construction Machinery Div.; and **William M. Wallace,** general manager of General Products Div. **A. D. Dennis,** assistant secretary and assistant treasurer of the company, was named secretary.

Progressive Welder Sales Co. has revealed election of Ray W. Heiden as president and general manager of all the company's plants and operations. The election fills the vacancy created by the death of Fred H. Johnson, company president and founder. Mr. Heiden has been an executive of the company for more than 21 years. At the same time, the appointment of Harry S. Rose as vice-president, national sales manager and member of the board was announced. Mr. Rose was formerly chief engineer of the company.

Two new vice-presidents at The Producto Corp. are Denzil Hawkins and Theodore Rancont. The two men are branch managers in Dayton and Detroit, respectively, and will continue in those capacities.

At its 56th annual meeting, National Machine Tool Builders' Assn. elected **Alfred V. Bodine** as president for the coming year. He is president and treasurer of the Bodine Corp. Other officers elected to serve with President Bodine were **Ralph J. Kraut,** first vice-president, **Allan C. Mattison,** second vice-president, **Graham E. Marx,** treasurer, and **Walter K. Bailey,** secretary. Mr. Kraut, who is a member of ASTE's Fond du Lac chapter, is vice-president of Giddings and Lewis Machine Tool Co. Mr. Mattison is president of Mattison Machine Works. Mr. Marx is vice-president and general manager of The G. A. Gray Co., and Mr. Bailey is president of Warner & Swasey Co. Mr. Bailey also is a member of ASTE's Cleveland chapter.

Election of **John B. Kendall** as vice-president has been made public by Delta Welder Corp. He has been in charge of the Ford Motor Co. Chicago stamping plant.

New president of the Solid Carbide Institute is **Clinton E. Smith,** assistant to the general sales manager at Pratt & Whitney Co. Inc. The Institute is concerned with a standardization program that governs sizes and types of carbide tools used by industry.

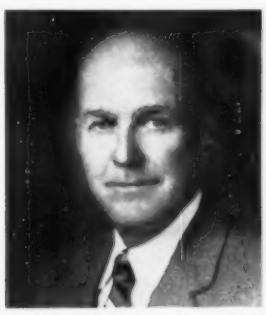
Philip R. Marsilius, who is executive vice-president of The Producto Machine Co., was elected president of National Tool & Die Manufacturers Assn. He is a member of ASTE's Fairfield County chapter.



V. L. Bradford, formerly executive vice-president, now becomes president of the Milford Rivet & Machine Co. after 12 years of service to succeed F. H. Merwin who was elevated to chairman of the board of directors.



T. Laurence Strimple, secretary and general counsel of The National Acme Co., was elected to the office of president. He succeeds Frederic H. Chapin who continues as chairman of the board.

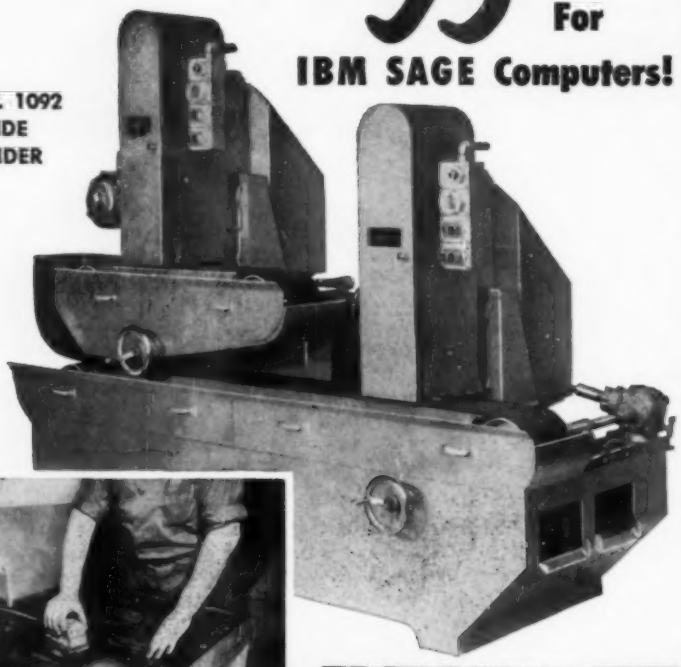


W. F. Kruspe, who was executive vice-president of Valvair Corp.—Sinclair-Collins Valve Co., is now president and general manager, succeeding J. E. Collins who now fills the newly formed post of board chairman.



ENGELBERG Two-Side Grinder Cuts Printed Circuit Finishing Time by 93% For IBM SAGE Computers!

MODEL 1092
2-SIDE
GRINDER



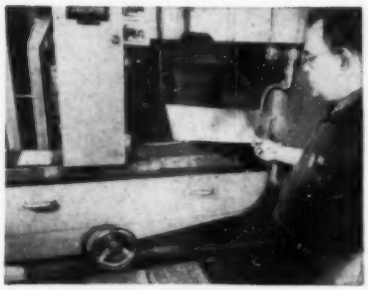
THE ORIGINAL OPERATION

An Engelberg conveyor-type abrasive belt grinder has multiplied production *by sixteen* – and virtually eliminated rejects – on a finishing operation at the Kingston, N. Y. plant (Military Products Division) of International Business Machines Corp.

Here the I.B.M. SAGE Computer is produced for the U.S. Air Force. To produce printed circuits for this computer, perforated phenolic sheets are copper clad on both sides, then coated with graphite. Excess graphite remaining on the two surfaces must then be removed.

Previously, the sheets were sanded under water by a pneumatic, oscillating hand sander. Sixteen man-hours were required to meet daily production.

Using a 240-grit belt, the Engelberg Model 1092 (described at right) removes .0001" on one pass . . . flips the sheet . . . removes .0001" from the other surface . . . all in a single cycle. The graphite coating remains only to coat the walls of the holes pierced in the part.



SOLUTION TO IBM'S PROBLEM:
THE MODEL 1092 TWO-SIDE GRINDER

This high-production, semi-automatic abrasive belt machine gives precision finishing to close tolerances on both flat surfaces of *any* ferrous, nonferrous, plastic or other materials. Piece-work first passes under grinding head at left, then is carried around to bottom conveyor belt with unground face *up*, positioned for passage under second grinding head at right.

For complete information on this and other Engelberg Abrasive Belt Grinders consult your Sweet's Catalog or write . . .

The ENGLEBERG-HULLER Co., Inc.
301 Seneca St., Syracuse, N. Y.

ENGELBERG PRECISION ABRASIVE-BELT GRINDERS

FOR FURTHER INFORMATION USE READER SERVICE CARD; INDICATE A-1-192

C. E. Stryker, of Maysteel Products, Inc., was elected president of Pressed Metal Institute at the organization's recent annual meeting in Bermuda. Other officers elected were **Carter Higgins,** of Worcester Pressed Steel Co., first vice-president; **Darwin W. Clay,** of Parish Pressed Steel Div. of Dana Corp., second vice-president; **Bryand Gemmill,** of The American Stamping Co., secretary-treasurer; and **Mel Lorentz,** HPL Mfg. Co., assistant secretary-treasurer. Mr. Clay also is a member of ASTE's Schuylkill Valley chapter.

Gerald C. Saltarelli now fills the newly created post of senior vice-president at Houdaille Industries, Inc. and has administrative responsibility for all the company's manufacturing plants and units. He formerly was vice-president in charge of production.

Leonard M. Clark and George F. Hagger have been appointed vice-president and vice-president of engineering, respectively, at Snap-Tite, Inc. Mr. Clark has been sales manager, while Mr. Hagger previously was director of engineering.

Appointment of **Don W. Branning** as manager of the American Broach and Machine Div. has been announced by Sundstrand Machine Tool Co.

General Grinding Wheel Corp. has announced election of **Clarence Tolan, Jr.** as chairman of the board of directors and of **Jacob S. Disston, Jr.** as vice-chairman of the board. Mr. Tolan has been president of Dodge Steel Co. and Mr. Disston was formerly president of Henry Disston & Sons, Inc.

Harold J. Bergum has joined Nylok-Detroit Corp. as plant manager in charge of new manufacturing facilities at 1893 Barrett Rd., Troy, Mich. He previously was associated with Ford Motor Co. engineering department.

According to announcement from Associated Spring Corp., **Don A. Jackson** has been promoted to factory manager of The Wallace Barnes Co. Ltd., the Canadian subsidiary in Hamilton, Ontario. He has been associated with the company since 1940.

E. F. Mitchell is new vice-president and general manager of Vitrified Wheel Co.

Square D Co. announced appointment of **Paul A. Christenson** to the newly created post of works manager in the expanded operations of the industrial controller division. He has been production manager of the local operations in Milwaukee and will continue those activities as well as planning and coordinating all manufacturing operations.

technical Shorts

Researchers Work On New Type Magnetic Steel

Scientists at Westinghouse Research Laboratories have developed a new kind of magnetic steel, called Cubex steel, which is described as "doubly-oriented silicon-iron," or "cube-oriented silicon-iron." The material is expected to be used in the magnetic cores of electrical devices such as transformers, motors and other electrical equipment. Metallurgical processes involved in preparing the silicon-iron were originated by scientists at the Vacuumschmelze of Hanua, Germany—a division of the Siemens-Halske Co.

In preparing the new material, the Westinghouse scientists discovered a new mechanism for crystal growth in metals. As a result, the new silicon-iron has a crystal arrangement which is contrary to that normally encountered in the metal and difficult to bring into being.

Crucial characteristic imparted to the steel by its unusual crystal orientation is an ability to be magnetized easily in four directions. This permits magnetism to readily "turn corners" in the magnetic core of a piece of electrical equipment.

Conventional steel now used in magnetic cores is known as "singly-oriented," and can be easily magnetized in two directions only: that is, back and forth along the direction in which the steel is rolled during its manufacture. For this reason, to provide the best magnetic path all around the rectangular core of a large transformer, the core is built up of straight strips of metal laid at right angles into a rectangular shape.

In the case of the new material, however, L, E, U-shaped, or even rectangular punchings, could be stamped from a sheet of steel in one operation, simplifying construction of the core, and giving an improved magnetic path.

Cube-oriented silicon-iron was obtained by reorganizing crystal arrangement normally found in the metal. Nature arranges atoms of iron in such a manner that they form crystals in the shape of tiny cubes. Magnetically, it turns out that the direction along any edge of the cube represents an easy path for magnetization; directions across any face of the cube, or diagonally through it, represent difficult paths. Therefore, to have a good magnetic core material, these tiny cubic crystals must be lined up properly, or oriented, in the metal.

Crystal arrangement in a sheet of the new cube-oriented magnetic steel might be compared to the arrangement of a tray of ice cubes. Each cube rests flat on one side and squarely faces the ends and sides of the tray. Therefore, the edges of each cube are exactly aligned with each other and are always parallel to the ends (width) and sides (length) of the tray. Since the cube edges represent easy directions of magnetization, good magnetic paths exist along both the width and length of the sheet.

In contrast, crystals in ordinary singly-oriented silicon-iron are so arranged that only the lengthwise path exists.

According to Dr. Clarence Zener, director of Westinghouse Research, hot-rolled unoriented silicon-iron—the first true magnetic steel — was introduced into the electrical industry at the turn of the century. Then came singly-

SEIBERT ADAPTERS



View of 350 ft. Cross-built V-8 cylinder block machine equipped with Seibert Adapters. Performs a total of 555 operations.

"Meet Our Standards Completely"

Says THE CROSS COMPANY • Detroit

CHECK THESE SEIBERT FEATURES

- Designed with convenient starting ring for easy installation.
- Relieved key seat eliminates swell, assures easier setups.
- Manufactured to GMC, Ford, Chrysler & ASA standards.
- Lot produced, economically priced.

● High production machine tools, like The Cross Company builds for the automotive industry, are a marvel in machining efficiency. All heads and tools must function smoothly and accurately within precision limits. Seibert "Shur-Lock" Adjustable Adapters, play an important part in maintaining the precision and efficiency required. For example, they are built to hold total concentricity within .002 (total indicator reading) 6" from end of the adapter—one reason why The Cross Company says, "Your production tools meet our standards completely." You can depend upon Seibert service, too. There is a Seibert man near you—ask for his phone number today.



New Tool Control Board—individually designed to suit your needs.



WRITE FOR ADAPTER BULLETIN, LATEST PRICE LIST

Ask for Folio 2-50. Gives complete specifications. Lists range of sizes available from stock. Ask also for brochure illustrating new control boards and complete line of holding tools.

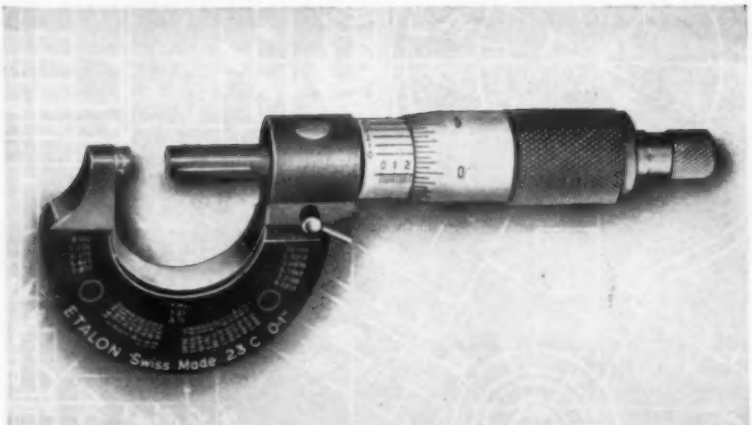


SEIBERT & SONS, INC. 1003 E. 24th STREET CHENOA, ILLINOIS

Quality MULTIPLE DRILL SPINDLES AND PRODUCTION TOOLS

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ETALON 23C MICROMETER

one piece stainless steel spindle

HARDENED AND GROUND FROM THE SOLID

• Reads to .0001" • Heavy duty tungsten carbide measuring faces • Forged frame • Dull chrome finish on thimble and barrel • Quick acting positive lock • Built for accuracy under the most rugged applications • Furnished in handsome contour case

AVAILABLE INDIVIDUALLY OR IN SETS FROM 0 to 12"
WRITE FOR CATALOG on complete line of precision measure instruments

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122 East Second St., Mineola, L.I., N.Y.

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FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-1-194-2

oriented silicon-iron, called Hipersil, developed and pioneered by Westinghouse and the American Rolling Mill Co. in the 1930's. Since that time, Westinghouse has conducted a continuous program of research on oriented silicon steel. Goal has been a high-quality, inexpensive cube-oriented material capable of large-scale manufacture. Considerable work still must be done in "scaling up" the new Cubex steel and finding the best ways of using it.

Three scientific laboratories were involved in the research and development which produced the new magnetic steel: The Vacuumschmelze laboratory in Germany, the Westinghouse Research Laboratories, and the Westinghouse Materials Engineering magnetics laboratory. Work at the Westinghouse Research Laboratories, was under the direction of Dr. George W. Wiener.

Cubex steel has about the same chemical composition of about 3 percent silicon to 97 percent iron. The real difference between it and standard magnetic steel comes from the way the steel is handled during its processing from rough sheet into the final product. The process responsible for producing cube-oriented silicon-iron has been shown to be operative in sheets thick enough to make it feasible for use in large transformers and motors. In thin strip, which is much easier to prepare, it has been made on a pilot-plant scale at the Westinghouse Materials Manufacturing Department at Blaisville, Pa.

Dr. Wiener emphasized that, thick or thin, Cubex steel is still in the laboratory stage of development. It is difficult to predict yet just how soon it will find general use in the electrical industry. Specialized uses requiring only thin sheet will no doubt be the first commercial applications to be encountered.

* * *

Liquid Material Developed for Vacuum Molds

HIGHLY DETAILED vacuum-forming molds can be made with a new liquid molding material developed by the Minnesota Mining and Manufacturing Co. The "Fura-Tone" mold is cast in mix form, employing an accelerator. Preferred method of casting is with a preformed vinyl sheet as the pattern. This sheet can be formed over the original plaster or wooden mold and backed up with plaster or with the original pattern to support the weight of the mix during casting and curing.

For the majority of patterns where a vinyl sheet is used, no mold release is required. Cure rate depends upon the shape of the mold as well as on room temperature. If rapid cures are desired, a heated cure cycle may be used.

Trade Literature

for free booklets and catalogs—use convenient request card, page 169

Brush Plating

Based on a paper presented at the American Electroplaters' Society by metal finishing consultant Marv Rubinstein, 12-page booklet, "Practical Brush Plating With the Dalic Process," explains the process, analyzes the metallurgical properties of the deposits, and describes typical time-saving engineering applications. Dept. TE, Marlane Development Co., 153 E. 26th St., New York 10, N. Y. **L-1-1**

Casters

Some 10,000 industrial and institutional casters and 500 different types of handling equipment described in coil bound catalog designed to consolidate and replace several older catalogs; products classified into four major color coded areas. All pages are removable to allow for addition or deletion of individual pages. The Colson Corp., Elyria, Ohio. **L-1-2**

Casting Process

Advantages of the Accu-Cast process for precision casting mold and die components in steel and other castable metals outlined in illustrated 4-page folder; shows typical applications, lists properties for Accu-Cast components, specifies types of alloys that can be utilized, and gives general pertinent data. Manco Products, Inc., 2401 Schaefer Rd., Melvindale, Mich. **L-1-3**

Seam Welding

Technical data on seam welding low-carbon and stainless steels presented in 16-page Bulletin SP-7A; includes charts, macrophotographs of welds, production photos and technical descriptions; also gives specific details on welding techniques and production speeds, use of interrupted and continuous current on low-carbon steel and other pertinent information. The Taylor-Winfield Corp., Warren, Ohio. **L-1-4**

Grinding and Boring Spindles

Illustrated 8-page brochure describes precision grinding and boring spindles and shows practical applications; shows many standard spindles in line. Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich. **L-1-5**

Ways

Extensively illustrated with photos and diagrams, 16-page bulletin describes company's ways, wear plates, aluminum bronze slides and standard cross sections; also gives information on company, equipment and method of producing ways. The Ohio Knife Co., Dept. U-65, Cincinnati 23, Ohio. **L-1-6**

Automatic Chucks

Well illustrated 4-page folder describes automatic pinch jaw chucks designed for chucking parts of large diameter and small cross section on vertical or horizontal spindle machines; includes specifications and outlines important special features. Cushman Chuck Co., Hartford, Conn. **L-1-7**



FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-1-195

The Whole Answer to Your Hole Problem . . . . it's Zagar GEARLESS DRILL HEADS



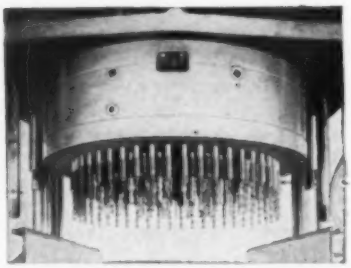
Any hole pattern—on any center up to 1½" dia.

ZAGAR SAYS: "Use more spindles—NOT more machines."

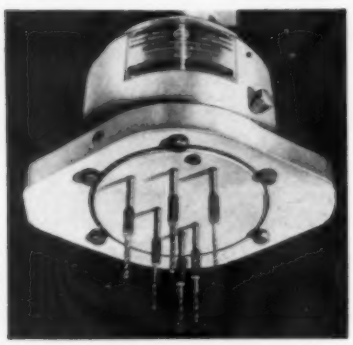
Have YOU heard the ZAGAR story?

Briefly:

Any number of holes at one pass—1200, for instance.
Any hole pattern, no matter how intricate.
Any machinable material.
Any hole diameter up to 1½", or varying diameters on all centers up to sum of two hole diameters involved.

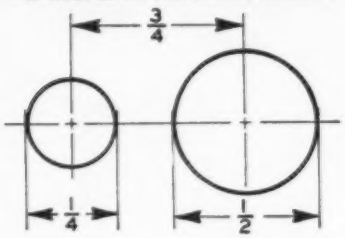


Up to 1200 holes can be drilled IN ONE PASS.



The Zagar "66" gearless drill head drills 6 holes up to 3/16" dia.

—as close as the sum of hole diameters



Emphasized: standard Zagar Gearless Drill Heads can be installed on your present presses. If you prefer, Zagar engineers will design the right tooling for the "hole" job. Send sample parts and profit by Zagar's extensive drilling background.

Get Zagar's Engineering Manual E-1

ZAGAR INCORPORATED

23892 LAKELAND BOULEVARD, CLEVELAND 23, OHIO

Zagar TOOLS FOR INDUSTRY and SPECIAL MACHINERY

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-1-196

Gears and Reducers

Illustrated 140-page pocket size booklet includes not only descriptions, dimensions and specifications of its line of reducers and stock and special gears, but also offers information on reducer selection, installation and maintenance and provides a 26-page section covering pertinent engineering data and tables. Ohio Gear Co., 1333 E. 179th St., Cleveland 10, Ohio. **L-1-8**

Cutters and Accessories

Descriptions of more than 200 new items included in 96-page illustrated Catalog No. 37C which covers complete line of metal cutting tools and accessories; also incorporates section of pertinent data tables such as basic speed and feed recommendations, hardness conversion tables, standard dimensions and tolerances, taper standards, etc. as well as useful, illustrated information on grinding and cutting. Brown & Sharpe Mfg. Co., Providence, R. I. **L-1-9**

Wrench

Leaflets describe and illustrate Tip Wrench, designed for use in hard-to-reach places, and outlines tool's features and advantages. Tipco Mfg. Co., 14760 Calvert, Van Nuys, Calif. **L-1-10**

Precision Tools

Photos, drawings and diagrams illustrate 32-page book giving descriptions and prices of complete line of R and L tools for automatic screw machines and turret lathes; also contains extensive information and instructions relative to proper use of the tools. R and L Tools, 1825 Bristol St., Philadelphia 40, Pa. **L-1-11**

Comparators

Extensively illustrated 38-page Catalog 5700 explains what optical comparators are, what they do and how they work; pictures and describes various models in company line and their important features; also shows numerous charts available, describes their uses and lists specifications. Jones & Lamson Machine Co., Springfield, Vt. **L-1-12**

High Strength Steels

Sixteen-page booklet, "Ultra-Strength Steels", describes in detail all grades of ultra-strength with yield strengths over 200,000 psi available in the United States; includes technical data and numerous tables concerning composition and properties of the materials, and outlines their various end uses. Climax Molybdenum Co., 500 Fifth Ave., New York 36, N. Y. **L-1-14**

Diamond Tools

Technical outline on correct applications of diamond wheels, properties and characteristics, recommended grinding speeds, grading of diamond wheels and other informative data on diamond tools and wheels presented in 36-page Catalog No. 1056 which presents specifications for company's line. A.I.T. Diamond Tool Co., 8221 N. Kimball Ave., Skokie, Ill. **L-1-15**

Lubricator

Two-page technical reference, No. TR-57C, gives detailed description of hydraulically operated Cyclic Y lubricator. Service, Bijur Lubricating Corp., 151 W. Passaic St., Rochelle Park, N.J. **L-1-16**

Tool Steels for Forging

Up-to-date technical information on tools for the hot forging of steels presented in 16-page brochure; includes details of basic forging operations, tables give recommended materials for tools, their application and heat treatments for all forging requirements; also presents compositions of Crucible's steels, table of shop experience, causes of problems and corrections. Crucible Steel Co. of America, The Oliver Bldg., Mellon Sq., Pittsburgh 22, Pa. **L-1-17**

Programming

Homespun remedies for electronic computer programmer's problems are published monthly in "The Compleat Programmer" which serves as handbook of programming and coding techniques for the Datatron 205, Datatron 220 and ElectroData 101. ElectroData Div., Burroughs Corp., 460 Sierra Madre Villa, Pasadena, Calif. **L-1-18**

X-Ray Instrumentation

Engineering data on newest X-ray instruments for element analysis and structure determinations presented in illustrated 12-page brochure; text covers basic diffraction equipment as well as more specialized instruments. Instruments Div., Philips Electronics, Inc., 750 S. Fulton Ave., Mount Vernon, N. Y. **L-1-19**

Worm Gearing

Extensive technical information on design and application of double enveloping worm gearing presented in 24-page Bulletin CD-200; includes detailed engineering formulae and step-by-step instructions for using them in designing and applying Cone-Drive gearing to drives of all types; also gives service factors and lubrication information. Cone-Drive Gears, Div. of Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich. **L-1-20**

Atrax PROGRESS REPORT

SOLID CARBIDE TOOLS

CASE HISTORY #17
WESTERN ELECTRIC CONTROL MANUFACTURER



Atrax SPECIAL DRILL .125" diameter

OPERATION — Removing fin burs left by compacting die.
MATERIAL — Plastic resistors
SPEED - FEED — 16,000 r.p.m.
PRODUCTION — 3 weeks per Solid Carbide tool. Only one day for H.S.S. drill.

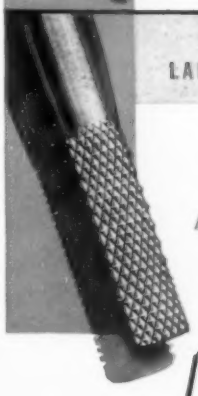
CASE HISTORY #22
MIDWEST AIRCRAFT MANUFACTURER



Atrax ROUTERS Series 1540

OPERATION — Routing an assembly.
MATERIAL — Fiberglas & hard aluminum
SPEED - FEED — 20,000 r.p.m., hand feed
PRODUCTION — Solid Carbide production 100 times that of H.S.S. tools.

CASE HISTORY #35
LARGE MACHINE TOOL MANUFACTURER



Atrax A-23 BUR Fine Diamond Cut

OPERATION — Interrupted I.D. Grinding Stock removal .006"
MATERIAL — H.S.S. Rockwell C62-64
SPEED - FEED — 31,000 r.p.m.
PRODUCTION — Solid Carbide Bur produced 500 piece parts per sharpening.

Atrax

Send today for the "STANDARD REFERENCE" on Carbide Tooling—96 pages of tools and information.



THE ATRAX COMPANY
Newington 11, Connecticut

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new FOR OPTICAL GAGING

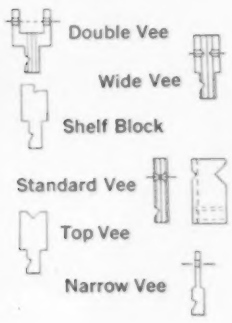
MULTI-USE FIXTURE PROVIDES LOW COST STAGING FOR MANY SMALL PARTS



Photo courtesy Eastman Kodak Co.



O. G. P. Multi-Use Fixture fits all types of optical comparators.



O.G.P's NEW Multi-Use Fixture has replaceable part holders designed for holding many types of small parts. Standard holders in varying sizes and shapes are available (see drawings above). Quickly locks into keyway with clamp.

EVERYTHING TO MAKE YOUR OPTICAL COMPARATORS MORE USEFUL

We also supply all types of standard charts, custom charts, layout accessories, fixture bases, and custom fixtures to meet your specialized requirements.

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I'd like more data on the NEW O. G. P. Multi-Use Fixture.

Name ..... Title .....
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OPTICAL GAGING PRODUCTS, INC.
SPECIALISTS IN PROJECTION GAGING

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Mold Sets and Accessories

Useful as reference book for mold designers and moldmakers, 275-page catalog includes detailed platen data covering different makes and models of injection molding presses, die casting machines and compression molding presses as well as other useful technical data such as charts on shrinkage, draft angles and hardness conversion. Catalog also presents company's line of mold sets and accessories. Request only on company letterhead directly from National Tool & Manufacturing Co., Kenilworth, N. J.

Casting

Revised edition of "Die Casting with Zinc Base Alloys" offers helpful data on factors influencing production of sound zinc alloy die castings with good surface finish; also includes outline of common faults or defects in castings, what causes them and how they may be avoided. Henning Bros. & Smith, Inc., 91-127 Scott Ave., Brooklyn 37, N. Y. **L-1-21**

Chemicals

Characteristics, grades and containers for 24 basic chemicals used by industry described in 16-page booklet; presents information on organic, inorganic and specialty chemicals, and lists location of production points for each product. Olin Mathieson Chemical Corp., Industrial Chemicals Div., Baltimore 3, Md. **L-1-22**

Profile Measurement

Well illustrated, 14-page Catalog 157 describes profilometer equipment stressing special features, practical uses, and giving specifications. Micrometrical Mfg. Co., 345 S. Main St., Ann Arbor, Mich. **L-1-23**

Electromagnetic Relays

Papers presented at fifth national conference on electromagnetic relays published as a 132 page booklet; includes tables, graphs, diagrams and illustrations. The papers were prepared by authors representing relay users, manufacturers, universities and government agencies. Potter & Brumfield, Inc., subsidiary of American Machine & Foundry Co., Princeton, Ind. **L-1-24**

Steels

Illustrated catalog outlines company's services and facilities and also presents chart showing grades, typical analysis, physical analysis, weldability, comparable specifications and remarks regarding formulae of various types of steels. Induction Steel Castings Co., Inc., 18021 E. Nine Mile Rd., East Detroit, Mich. **L-1-25**

good READING

PATENT NOTES FOR ENGINEERS — *7th Edition—By C. D. Tuska. Published by McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N. Y. Price $4. 198 pages.*

This manual bridges the gap between the inventor and the patent attorney. It gives a clear idea of what patentable inventions are and how to protect them. It also explains the relations of employer and employee in patent matters.

Chapters explain how applications are prepared, filed and acted upon; and what happens when applications of rival inventors are placed in interference.

Statutory invention, its nature and practical aspects, has been thoroughly covered, and gives the reader a view of the subject through the eyes of the courts.

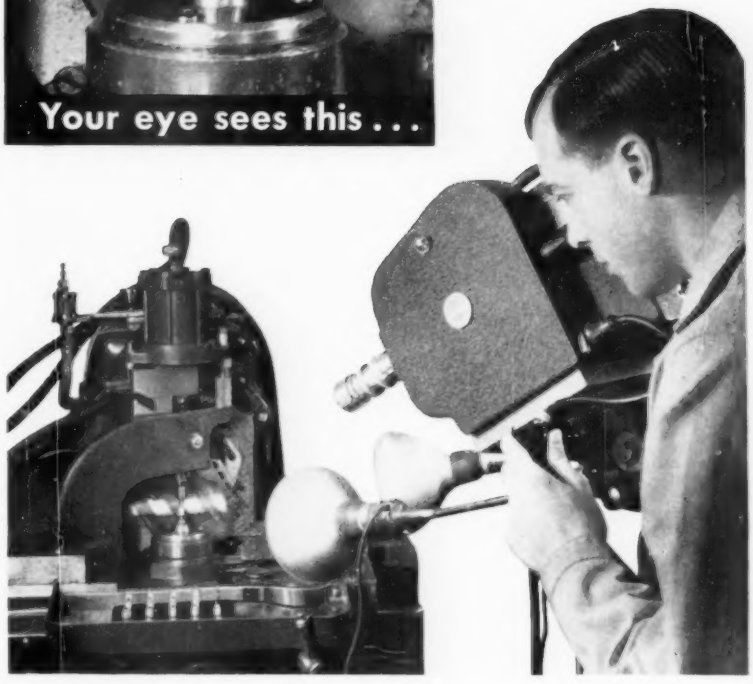
The object of this book is to erect clear warning signals along the path which leads from the conception of an invention in the inventor's mind to his ownership of a patent. Properly heeded, these warnings may constitute the difference between one's acquiring wisdom from bitter experience and his acquiring valuable patent rights.

THE ECONOMIC CONSEQUENCES OF AUTOMATION—*By Paul Einzig. Published by W. W. Norton & Co., Inc., 55 5th Ave., New York, N. Y. Price $3.95. 256 pages.*

Automation—the use by industry of self-operating and self-regulating machines incorporating electronic devices which check the product automatically and adjust the machine accordingly—is already a reality in numerous factories and is technically a possibility for many more. Its intensive adoption is widely considered to open up both the economic potentialities and the social dangers of a new industrial revolution.

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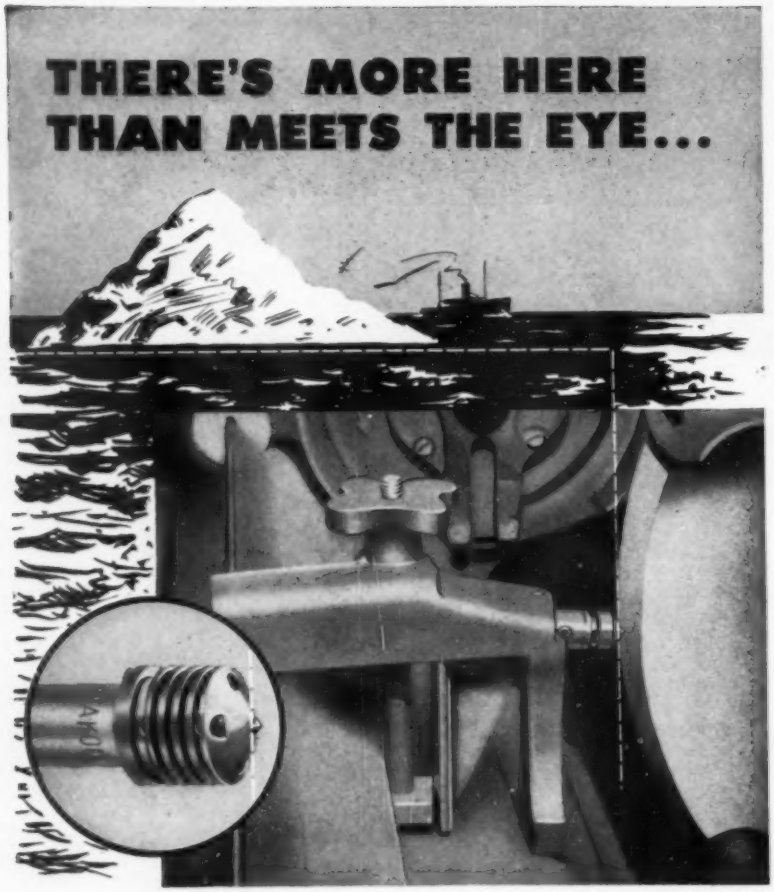
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attention they deserve. A small number of books have been published on the social or commercial aspects, but no attempt has been made to cover systematically the wide range of the highly involved problems arising from the impact of automation on national economy and world economy. This book bridges the gap between automation and its economical consequences.

Dr. Paul Einzig is political correspondent of the Financial Times, and London correspondent of the Commercial and Financial Chronicle. He is considered one of the leading authorities on financial matters.

MODERN MATHEMATICS FOR THE ENGINEER—*Edited by Edwin F. Beckenbach. Published by McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N. Y. Price $7.50. 516 pages.*

Engineers will find here the practical mathematical techniques which will enable them to more effectively meet the requirements of today's highly developed technical programming and design Nineteen acknowledged experts not only explain modern applied mathematics, but also demonstrate in readily understood terms how each method is best used. They give concrete help in three vital areas: (1) in formulating and solving design problems by using mathematical models; (2) in applying mathematics of chance and probability; (3) in obtaining numerical solutions and working with high-speed computing equipment.

This book is the second of the contributed textbooks which grew out of the highly successful engineering extension lecture courses at the University of California at Los Angeles. The first book in the series was *Modern Physics for the Engineer* which was reviewed in the March 1957 issue of THE TOOL ENGINEER.

METAL GRATING HANDBOOK—*Published by the Metal Grating Institute, Inc., One Gateway Center, Pittsburgh 22, Pa. Price $1. 32 pages.*

This technical publication represents a product standardization in the metal grating industry. The book contains informative text, schematic drawings, tables and actual installation photographs as well as complete standards and specifications. It also contains a glossary of terms and definitions used throughout the metal grating industry.

This new handbook will find wide application in a variety of industries by those who specify, buy, or use metal grating and treads. It is not a manufacturers' catalog but rather a technical guide prepared by the industry itself.

who's meeting and where

Jan. 6-8. RELIABILITY AND QUALITY CONTROL, fourth national symposium. Hotel Statler, Washington, D. C. Complete data is available from Richard M. Jacobs, RCA Bldg. 108-2, Moorestown, N. J.

Jan. 13-17. MACHINE DESIGN SEMINAR, sponsored by The Lincoln Electric Co. to cover ways to design and fabricate welded machinery. Obtain information from Robert Wilson, Director of Application Engineering, The Lincoln Electric Co., Cleveland 17, Ohio.

Jan. 27-28. INDUSTRIAL HEATING EQUIPMENT ASSOCIATION, INC. Annual winter meeting, Penn-Sheraton Hotel, Pittsburgh, Pa. Direct inquiries to IHEA headquarters, Associations Bldg., Washington 6, D.C.

Jan. 27-30. PLANT MAINTENANCE & ENGINEERING SHOW AND CONFERENCE. International Amphitheatre, Chicago, Ill. For complete information, contact exposition managers, Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y.

Jan. 27-Feb. 6. ENGINEERING AND MANAGEMENT COURSE, sponsored by University Extension and College of Engineering and the Graduate School of Business Administration of University of California. Conducted at the school's Los Angeles campus. Direct inquires to Edward P. Coleman, University of California Extension, Enigneering, Los Angeles 24, Calif.

Jan. 28-31. SOCIETY OF PLASTICS ENGINEERS, INC. 14th annual technical meeting, Sheraton-Cadillac Hotel, Detroit, Mich. Details may be obtained from C. H. Whitlock, C. H. Whitlock Associates, 21655 Coolidge Hwy., Oak Park 37, Mich.

Jan. 30-31. AMERICAN SOCIETY FOR ENGINEERING EDUCATION, relations with industry division, 10th annual College-Industry Conference, University of Michigan, Ann Arbor, Mich. Other information is available from U of M College of Engineering, 255 West Engineering Bldg., Ann Arbor, Mich.

Feb. 3-4. INSTRUMENT SOCIETY OF AMERICA. Conference on progress and trends in chemical and petroleum instrumentation, Wilmington, Del. For more data write to H. S. Kindler, director of technical programs, ISA, 313 Sixth Ave., Pittsburgh 22, Pa.

Feb. 4-6. THE SOCIETY OF THE PLASTICS INDUSTRY, INC., Reinforced Plastics Div. 13th annual technical and management conference and industry exhibit, Edgewater Beach Hotel, Chicago, Ill. Contact society office, 67 W. 44th St., New York 17, N. Y.

Feb. 13-15. NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS. Spring meeting, Michigan State University, East Lansing, Mich. For details contact society headquarters, 2029 K St. N.W., Washington 6, D.C.

Feb. 18. ROCHESTER SOCIETY FOR QUALITY CONTROL. 14th annual quality control clinic, War Memorial, Rochester, N. Y. For details, write to Edward F. Winterkorn, Eastman Kodak Co., Navy Ordnance Div., 50 Main St. West, Rochester 14, N. Y.

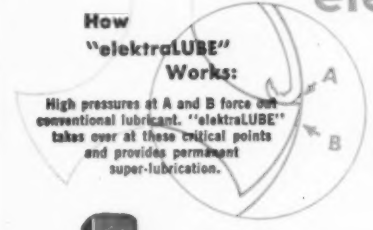
Feb. 24-28. MACHINE DESIGN SEMINAR, sponsored by The Lincoln Electric Co. Details may be had from Robert Wilson, Dir. of Application Engineering The Lincoln Electric Co., Cleveland 17, Ohio.

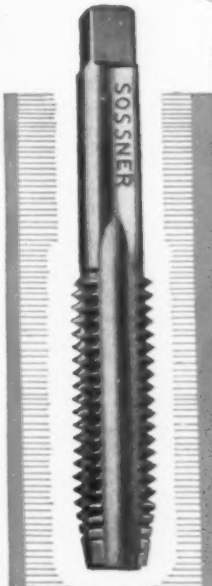
Mar. 12-14. PRESSED METAL INSTITUTE.

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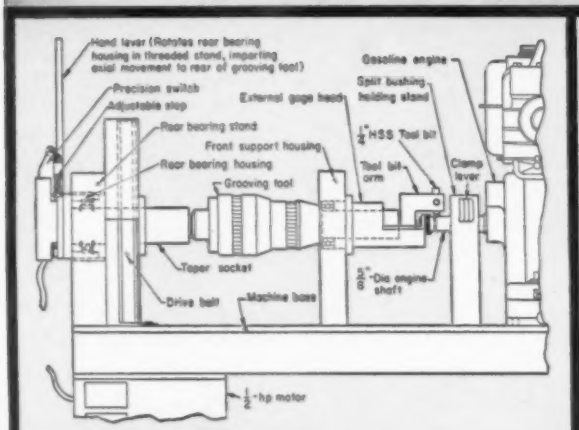


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Spring technical meetings, Sheraton-Cadillac Hotel, Detroit, Mich. For details write to institute office, 3673 Lee Rd., Cleveland 20, Ohio.

Mar. 16-22. AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Nuclear congress, International Amphitheatre, Chicago, Ill. More information is available from society offices, 29 W. 39th St., New York 18, N. Y.

Mar. 17-18. STEEL FOUNDERS' SOCIETY OF AMERICA. 56th annual meeting, Drake Hotel, Chicago, Ill. Request more data from society headquarters, 606 Terminal Tower, Cleveland 13, Ohio.

Mar. 17-21. ENGINEERS JOINT COUNCIL. Nuclear Congress, sponsored by 30 national groups, International Amphitheatre and Palmer House, Chicago, Ill. For information address congress manager, American Institute of Chemical Engineers, 25 W. 45th St., New York, N. Y.

Apr. 13-18. AMERICAN CHEMICAL SOCIETY. Spring meeting, San Francisco, Calif. Send inquiries to society offices, 1155 Sixteenth St., N.W., Washington 6, D. C.

Apr. 14-18. AMERICAN WELDING SOCIETY, INC. Annual national meeting and welding show with ASME conference. Statler and other hotels, St. Louis, Mo. Write to society headquarters, 33 W. 39th St., New York 18, N. Y. for more details.

Apr. 16-25. BRITISH ELECTRONICS SHOW, Olympia Hall, London, England. Inquiries or space applications may be addressed to the organizers: Industrial Exhibitions Ltd., 9 Argyll St., London, W.1, England.

Apr. 22-24. AMERICAN SOCIETY OF LUBRICATION ENGINEERS. Annual meeting and exhibit, Hotel Cleveland, Cleveland, Ohio. Write for more data to society office, 84 E. Randolph St., Chicago 1, Ill.

May 1-8. AMERICAN SOCIETY OF TOOL ENGINEERS. 26th annual meeting and 1958 Tool Show. Bellevue Stratford, Sheraton and Benjamin Franklin Hotels and the Philadelphia Convention Center. For details, contact Society headquarters, 10700 Puritan Ave., Detroit 38, Mich.

May 5-9. AMERICAN SOCIETY OF TRAINING DIRECTORS. 14th annual conference, Sheraton-Park Hotel, Washington, D. C. For further information write to the conference, ASTD, P. O. Box 958, Washington 4, D. C.

abstracts of

By M. Kronenberg
Consulting Engineer

Woodworking Machines

A survey of the development of woodworking machines is published in the same issue of *Werkstatt und Betrieb*. The article, by Kurt Tschernjakow, is based on the Industrial Show held at Hannover in 1957. (Not to be confused with the Machine Tool Show held some months later.)

As shown in the article, there has been a considerable development of the German woodworking machines since 1950. Title of the article is, "Entwicklung und Fortschritt im Bau von Holzbearbeitungsmaschinen unter Werkzeugen."

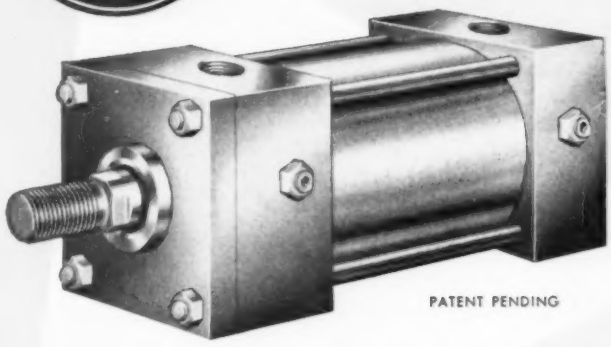
Noise associated with woodworking is often the cause for the slow improvement of woodworking machines, particularly such improvements as increasing the speed of the cutters on woodworking planers. New research carried out at the University of Brunswick (West Germany) has resulted in development of cutters with a helical arrangement of individual teeth, permitting an increase in speed with no increase in noise. Although such cutters have been developed before, new designs giving improved performance have been placed on the market. The article deals with planers, drilling machines, grinding machines, copying machines, combined woodworking machines, presses and others.

Cutting Sheet Metal

Curling of small strips cut off from sheet metal blanks is due to stresses set up in material under cut. These stresses are the topic of an article published by A. Wuetherich in *Werkstatt und Betrieb*, No. 8, 1957, under the title, "Neue Erkenntnisse ueber den ziehenden Schnitt bei Blechtafelscheren."

According to the author, the magnitude of these deformations depends on the direction of the cutting forces. The elastic limit of the metal will be exceeded when the angle between the knife and the surface of the sheet metal is relatively large. In such cases ma-

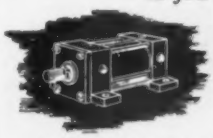
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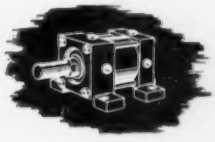
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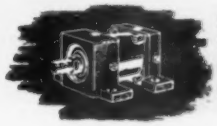
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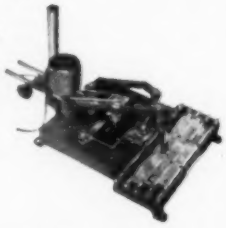
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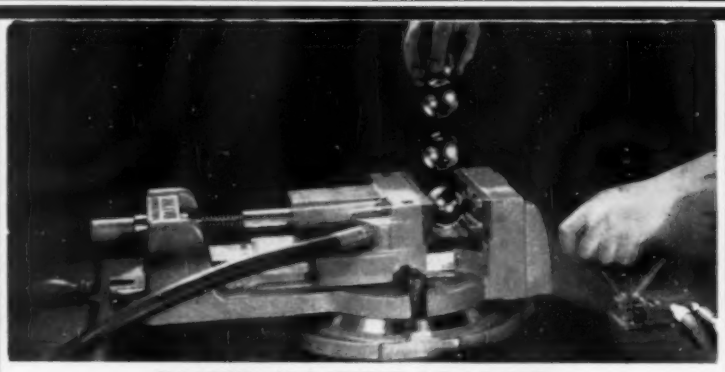


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terial in the tension zone stretches more than with smaller cutting angles, causing the cut-off strip to curl.

Curling is usually reduced when sheet metal of higher tensile strength is cut. This may be explained by the fact that the stresses set up in the metal do not exceed the elastic limit. In the case of softer materials, therefore, it is necessary to reduce the cutting angle. On machines with variable knife adjustment this is no problem.

The author discusses differences between the vertical cutting method and the oblique method introduced some 25 years ago. Comparing the two methods graphically, it is shown that cutting forces are less for the oblique method than for the vertical method. The total energy consumed in cutting by either method is the same; however, the force is smaller and the distance traveled is larger in the case of the oblique cut.

On the other hand, the curling of the strip is more pronounced in the case of the oblique cut than in the case of the vertical cut. The author presents several diagrams explaining the reasons for the differences. He concludes that it should be possible to reduce the curling by changing the motion of the upper knife relative to the sheet metal.

Power Roll-Forming

A semiautomatic hydraulic rotary extrusion machine of European origin is described in detail in *Werkstattstechnik und Maschinenbau*, No. 8, 1957. The article, by W. Bosch, is entitled, "Eine halb-selbstaetige hydraulische Streck-Drueck-Maschine."

The headstock is driven by a 13-kw motor and incorporates a stepless drive with a range of 1:5. In addition, a gear train in the headstock permits increasing the speed range to 1:63. The lowest spindle speed is 10 rpm and the highest 630 rpm, steplessly controlled.

A tracer device permits forming workpieces having irregular contours. The maximum radial force is 13,000 lb. Deflections due to radial forces are eliminated, according to the author, by the use of two rollers working opposite each other.

In the same issue of *Werkstattstechnik und Maschinenbau* there is an article on American power roll-forming machines, authorized by A. V. Dryak. A third article by F. Singer discusses the articles by Bosch and Dryak.

Singer suggests that distinction be made between "spinning," that is metal forming without changes in the wall thickness of the workpiece; "streck-drueckne" (literally "stretch-pushing"), which produces cylindrical workpieces with greatly reduced wall thickness, and "flowturning" as applied to the generation of conical workpieces by reducing

blank wall thickness. Singer is apparently unaware of the fact that cylindrical workpieces can also be produced on American machines.

Machinability of Bar Stock

An investigation on the effect of manganese and lead on the machinability of bar stock has been completed by H. Becker and H. Huff. The study was sponsored by the Association of German Mining Engineers. Results have been published in *Stahl und Eisen*, No. 18, September 5, 1957, under the title, "Einflus des Manganund Bleigehaltes auf die Zerspanbarkeit von unberuhigtem Automatenstahl."

Workpieces of eight different compositions were turned. At low cutting speeds, 18-5-1 high-speed steel tools were used. Carbide tools were used for higher speeds. The speeds were varied between about 75 fpm and about 600 fpm, using a depth of cut (with high-speed steel) of 0.020 inch and a feed of 0.004 ipr. With cemented carbides, the feeds and depth of cuts were approximately the same.

Manganese content varied between a minimum of 0.65 percent and a maximum of 1.33 percent. One composition contained 1.02 percent manganese and 0.22 percent lead.

The multiple aspects of machinability were taken into consideration by determining the unit cutting forces and the tool life measured for a standardized wear land at the flank of the tool, and a standardized cratering at the face of the tool. In addition surface roughness was measured.

The lowest unit cutting forces, indicating greatest ease of chip removal, were found when turning the specimen with the 1.02 percent manganese and 0.22 percent lead; cutting forces in this instance were as much as 50 percent lower than the average of all other specimens. This is obviously due to the lubricating effect of lead. Tool life obtained with this material was not different from that of the specimens with 1.06 and 1.20 percent manganese without lead.

The highest unit cutting force was associated with the highest manganese content, indicating that there is an optimum manganese content. Tool life is also affected by the oxides in the microstructure of the specimens. Tool life was best—as far as wear land is concerned—when the oxide content was high (0.03 percent) instead of less than 0.005 percent. The authors did not, however, come to a definite conclusion with regard to the reasons for the effect of the oxide inclusions. Surface finishes of the specimens with lead content and of those with high manganese contents are not as good as those obtained with the other specimens.

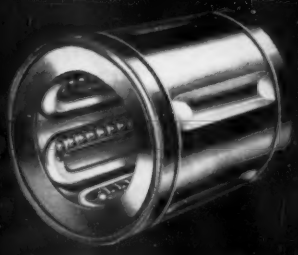
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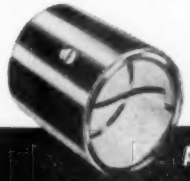
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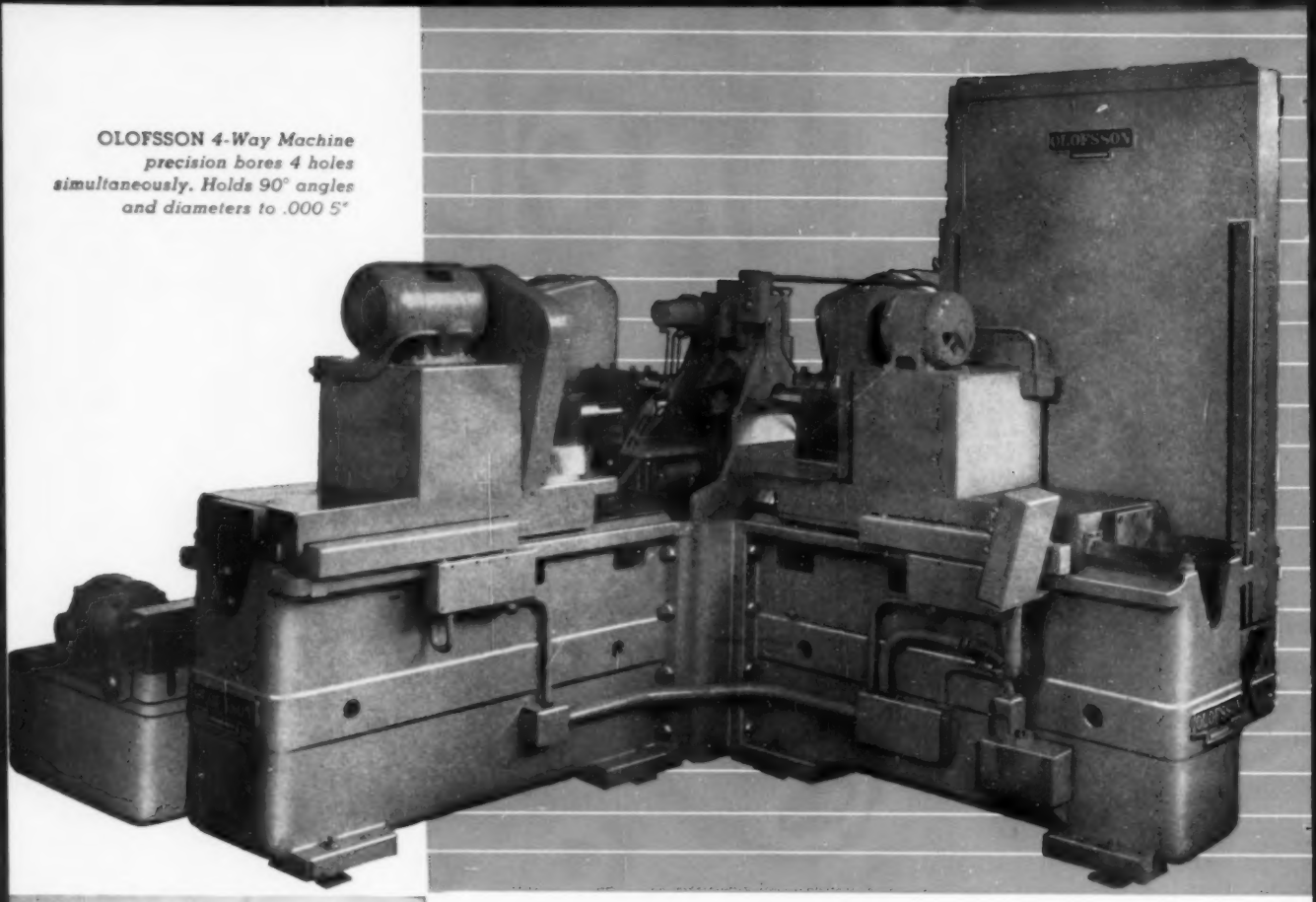
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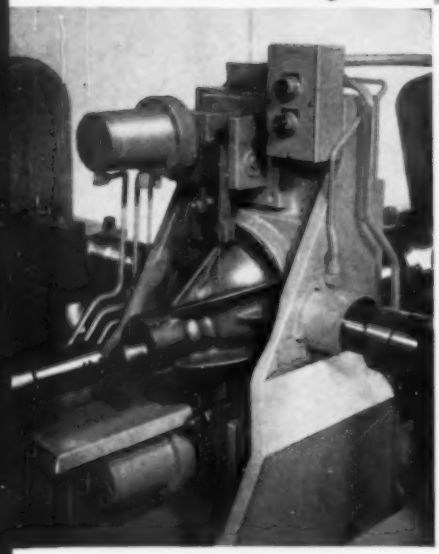


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Introducing numerical control

Tech Digests

By Leon E. Laux
Chief, Mfg. Research and Development
The Martin Co.
Baltimore, Md.

THE INFLUENCE of numerical control on a well established and going materials processing organization cannot be overestimated. Practically every operation necessary for the transformation of an idea from the origin of a design on down through the production of a part is subjected to radical change.

A year before the delivery of the first numerically controlled machine at Martin, an indoctrination program for all personnel who were to be engaged in materials processing for and the operation of our numerical control system was drafted and put into effect. This program entailed:

- Defining what was to be done in each and every step of the processing procedure
- Selecting qualified personnel for materials processing, equipment operation and maintenance
- Providing specialized training in computer technology and operation.

In implementing this program we realized that, with a majority of our machine tools still under manual and template control, it would be necessary, for the time being at least, to plan for both mediums of production.

Our conventional engineering drawings and processing methods could not be completely abolished in favor of numerical control. However, the system of dimensioning engineering drawings could be altered to permit a more rapid translation of dimensions into numerical control data.

Our experience to date indicates that the key man in our entire materials processing team is the manufacturing preplanner. Having a fairly good knowledge of manufacturing methods, machinery and specifically metal-cutting technology, he establishes the effectiveness of the entire numerical control system.

Once the basic numerical plan is established for a particular part, the remaining steps of transforming the plan into a machine control tape are fairly routine. They consist of:

- A write-up or manufacturing plan is first prepared describing, in detail, all conventional and numerically controlled machining operations and instructions
- Preparation of a numerical control drawing, which is a pictorial representation of the part, showing the path of the cutter and the sequence of cuts in lieu of conventional dimensions
- Preparation of a numerical control process sheet, containing machining data in numerical control code
- Preparation of the paper process tape, Flexowriter typing of the data appearing on the numerical control process sheet
- Retyping for verification of the original process tape
- Feeding of the process tape data through the computer and punching of the machine control tape.

All tape preparation is accomplished in an air-conditioned, humidity-con-

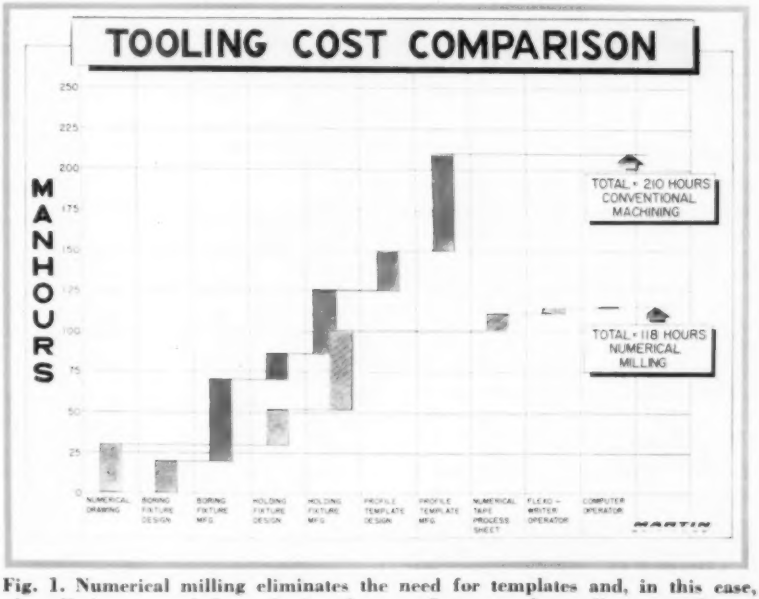
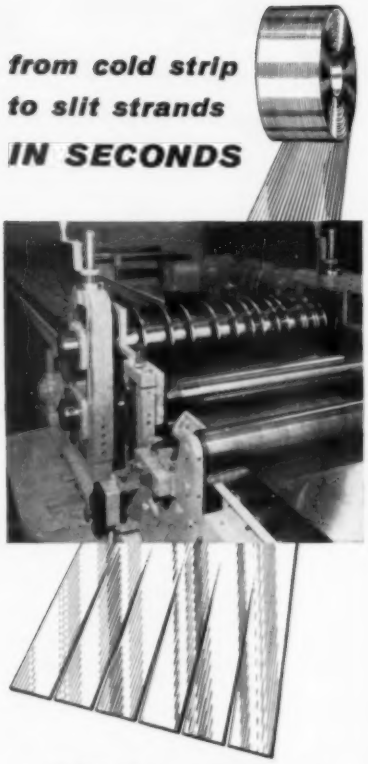


Fig. 1. Numerical milling eliminates the need for templates and, in this case, also eliminates need for a boring fixture. Consequently, tooling costs for an aircraft part are sharply reduced, as compared to conventional machining.



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to slit strands
IN SECONDS

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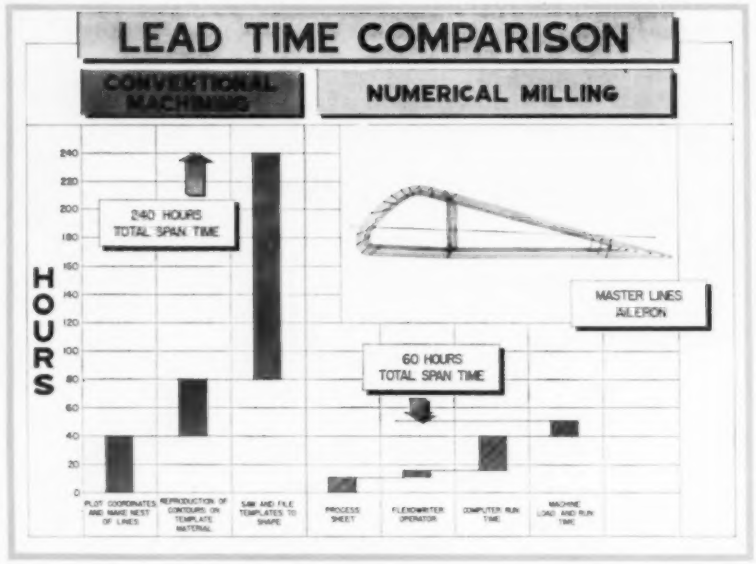


Fig. 2. Since templates are not required, mnimium lead time for production of aileron is 60 hours for numerical milling, as compared to 240 hours for conventional machining. Machine load and run time is short.

trolled room located in our manufacturing engineering office. Only the machine control tape, the write-up, and part drawing are forwarded to the shop. All other data, such as the numerical control drawing, the numerical control process sheet and the process tape, are filed for future use in the manufacturing engineering office.

The indoctrination of all people concerned with this new system must be broadened and made more comprehensive. The potentialities of numerical control can be realized only if we train people to think in terms of numerical control.

TO REQUEST COMPLETE PAPERS WRITE TO THE ADDRESS AND ORGANIZATION INDICATED AT THE END OF EACH ABSTRACT

Their thinking must be bold and imaginative so that all of the possibilities of this new system can be realized. Certainly their thinking must be as modern and efficient as the machine they work with. And this can come about if they are thoroughly trained to understand this new concept.

From a paper presented at the Third Annual Contour Machining Conference, sponsored by the True-Trace Corp., El Monte, Calif.

Reduced Lead Times

By Ralph Medros
Manager
Mil. Eng. Prog. & Master Scheduling, Production Engine Dept.
Aircraft Gas Turbine Div.
General Electric Co.
Evendale, Ohio

Industry's position in the business of defense is based mainly on two great contributions: achieving technological advances and making the transition from design concept to defense hardware.

We not only must sit on the egg—we must hatch it. In recent years, our technological advances have been made at a rapid rate. But these advances depend upon how efficiently and swiftly we can translate them into the required quantity of defense hardware.

Reducing production lead times—that's what it means—has several obvious advantages to industry. A few at the top of the list would include: beat competition on delivery, ability to promote new business. But there are more than economic or business motives involved here.

The most important reason for reducing production lead times is defense necessity. The defense industry must provide for the national defense. It must continually demonstrate its ability to

compete successfully with foreign defense industry in producing the best weapons in the shortest time possible.

Our greatest foreign competitor in this business may not have the technological advantage at a given time. But he may be capable of hatching his eggs faster. If that happens, then all our advanced theories that lie in books, in minds, and on drawing boards will be only a symbol of what might have been.

We in industry, therefore, have a national duty and a public obligation to put forth all our talents and utilize all our experience to cut lead times. That, briefly, is the urgency of the subject.

I would like to describe to you a workable system for cutting lead times: a technique of programming engineering design and production, and the management principles upon which it is based. It is not a theory. It is a working method now in practice. It is now used extensively by the U. S. Navy in its procurement operations. It has been used by the U. S. Army in the procurement of tanks. We in the General Electric jet engine business used it for the J47 engine production build-up during the Korean War. This program involved some 4,000 subcontractors and producing over 31,000 engines.

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First, let us briefly point out the method of cutting lead times. We all know that there is a point in design development of a complete product beyond which major changes in design will not occur. When this point is reached, it is possible to program production parallel with further design development, and achieve optimum results from both programs. In fact, this point in the development of a complex defense weapon has been a crucial one for several years. It is necessary to delay the production decision as long as possible in order to incorporate the latest and most successful state-of-the-art in design engineering. But this decision cannot be delayed too long. The whole program would be compromised.

Yet, I think we are all aware that a design for all practical purpose does not remain frozen after production is initiated. There will be some redesign and many design changes during the

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production build-up. This is natural and to be expected. If this is realistically accepted and prepared for, the long lead time development cycle of a complex product can be drastically reduced. The paralleling of further development with production fills this bill.

Things done in sequence take an over-all greater time than things done simultaneously. It becomes critically important, therefore, to parallel a production program to the design program, providing that the two partners—industry and the military—realistically work together in providing the necessary contributing elements.

Programming is the most important element in continuously exercising management authority in a complex organization. It coordinates and balances the objective, the plan, the communication system and the organization for implementation. Since it is a continuous activity, it must be dynamic rather than static. Therefore, it must be provided for within the organization and its processes. No one specialized organization can solely, by its own efforts, achieve the objective of the entire organization. All specialized efforts must be balanced to the rate of progress of the whole organization.

The point of what I'm saying is that programming is the key to the manager's control of his organization. The program, pictured as a series of the important milestones of a project, must be the current yardstick against which the manager decides to retain an existing activity or reject a proposed one, and how much he should do of each.

Programming utilizes four basic steps in the management process. The first of these is determination of the objective. Given an objective, the next requirement is an operating program which will carry out that objective. Once the operating program has been translated into action, it is necessary to develop a more or less mechanical procedure for periodically reporting progress to the coordinating authority. Lastly, the manager must compare and analyze actual performance against the program and objective. From this he can determine the need for and direction of new action.

From a paper presented at the National Aeronautic Meeting, Society of Automotive Engineers, Inc., 485 Lexington Ave., New York 17, N. Y.

▼ ▼ ▼

Future Developments in Aircraft

By Major General Davis H. Baker
Air Materiel Command
Wright-Patterson Air Force Base, Ohio

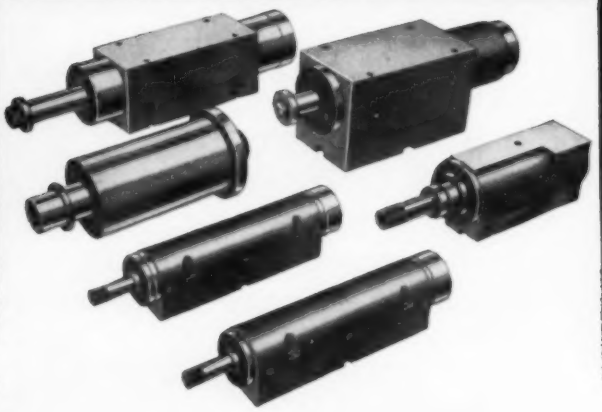
The advent of the nuclear weapons, with their terrible potential for havoc and annihilation has sharply reduced the numerical requirements for strategic air weapons as compared to WW II requirements. At the same time, however, the critical role of the delivery vehicles has placed great emphasis on the superior performance of the strategic weapons.

The technological advances that have taken our aircraft through the sonic barrier and into the supersonic speed regime have been almost as dramatic as the increases in the destructive power of our bombs. These "break-throughs" have been principally in the fields of propulsion, aerodynamics and electronic systems for guidance, navigation, bombing and fire control.

Underlying these achievements, of course, have been parallel advances in the production technologies by which it

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has been possible to produce these weapons. Those which have been particularly outstanding and with great impact on industry lie in the areas of structural materials, high-temperature alloys, manufacturing processes, metal-working techniques and production equipment. These developments have had a profound effect upon the production structure and have virtually revolutionized the aeronautical manufacturing arts.

All of this progress in superior aircraft has increased their complexity on a geometric scale. This complexity has added tremendously to their cost. It has also created many problems of reliability, maintenance and support. However, the end is not yet in sight. The emerging nonconventional propulsion systems such as ramjet engines, rocket motors and nuclear powerplants hold promise of great increases in speed, range and altitude for the new generations of aircraft. These power potentialities are being further enhanced by the technical possibilities of high energy fuels. Equivalent progress in aerodynamics, electronics and the related technical fields are being pushed as aggressively.

Throughout this era of growth and advancement in manned aircraft, we have seen the conception, development and arrival of the unmanned vehicle—the guided missile. Starting from zero, in the early postwar years, the technology of missiles is rapidly maturing. Scientific and technical break-throughs have been such that it is now possible to consider, on a serious basis, the dates and impacts of their initial operational capabilities.

From a talk given to the Society of Business Magazine Editors, 1015 National Press Bldg., Washington, D. C.

▼ ▼ ▼

Castings for Aircraft

By John H. Garrett

Office of Assistant Secretary of Defense
Washington, D. C.

Some of the most costly parts of airplanes today are the heavy steel forgings which are coming to be used where heavy concentrated loads are encountered, as in wing spars, attachment fittings, main bulkheads and landing gear components. A principal reason for the high cost is the extensive and difficult machining that must be done, in order to reduce weight.

The typical aircraft fitting is not well adapted to the forging process. For high strength in relation to weight, the metal should be mainly distributed around the periphery of the shape, with thin webs and ribs toward the center where the stresses are low. This leads to a requirement for forgings which are thick at the edges and thin at the center. This requires a large amount of metal flow, when forging from the usual round or square billet, and is difficult to forge to close tolerances.

It is necessary, then to do a very large amount of machining to bring the rough forging down to acceptable weight. It is not uncommon for the finished part to weigh only one-tenth as much as the forging prior to machining. As long as the parts were made of aluminum, this was not too bad, as the metal was cheap, and machining the soft aluminum was fast. Now that very hard grades of steel and titanium are coming into use, such fabricating methods are less acceptable.

An example of this is a forging made from 4340 steel which was exhibited to me at one of the aircraft plants. The finished machined forging was in the form of a hollow cube about 10 inches on a side, and weighed perhaps 12 pounds. The cost of the finished part was about $1200. The reason for this high cost is, of course, that the rough forging weighed some 300 pounds, and

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95 percent of this was machined away.

This points up one of our reasons for interest in castings for application in airborne vehicles. A casting can be made in an intricate shape, particularly where thin sections and ribs are involved, much closer to final dimension than a forging. This not only reduces the amount of metal required, but also greatly reduces machining time. Large forgings require the use of heavy presses where the overhead rate is very high. Also the cost of forging dies of large size is very high, and where only a few airplanes or missiles of a particular type are procured the prorated cost of the dies adds substantially to the cost of each forging. All of these factors point to castings as a possible means of reducing the cost of tomorrow's aircraft and missiles.

The other factor pointing to the desirability of using castings instead of forgings where feasible, is the shortage of die manufacturing capacity, which always becomes critical under national defense emergency conditions.

So here we have a situation where machined forgings are expensive, and in time of emergency, scarce. Castings, on the other hand, should be cheaper and should have shorter lead times than forgings under emergency conditions.

It is commonly assumed, of course, that castings are too heavy and undependable for use as primary load-carrying members of airplanes. One of the functions of a research organization is to re-examine established precepts to see if, where a sufficiently important objective is in view, a way cannot be found around technical obstacles to progress. It occurred to some of us that the deficiencies of castings may not necessarily be fundamental, but rather be due to inadequacies in foundry technique. If this should prove to be the case, a program to develop improved methods for making high integrity castings—particularly in alloys suitable for high strength elevated temperature applications—would be in order.

A special panel set up to study the problem is of the opinion that to overcome obstacles to wider acceptance of steel castings as reliable aircraft components: (1) it must be proven that steel castings meeting needed strength-weight requirements and of consistent high quality can be made in production quantities, (2) comprehensive and realistic quality standards and applicable specifications for quality desired must be established, (3) acceptable testing procedures must be developed, and (4) designers and founders must become cognizant of each other's problems and work in close cooperation.

From a paper delivered at a meeting of the Investment Casting Institute, 27 E. Monroe St., Chicago 3, Ill.

▼ ▼ ▼

Growth—or Stagnation

By Frederick H. Mueller
Assistant Secretary of Commerce
Washington, D. C.

If we are to make progress we must increase our productivity. In fact we must do so even to maintain our present standard of living for the almost 3 million annual net increase in our population estimated for the years ahead.

We must produce about 40 percent more goods and services by 1965 with only 14 percent more people in the work force, according to recent testimony of the president of General Electric, Ralph J. Cordiner. This means more automation and more investment per worker. For we have to face the fact that, in certain service trades for instance, it's a practical impossibility to achieve greater production per man-hour.

This puts the problem of growth—or stagnation—squarely up to the production worker, production manager, industrial salesman—and you in the strategic phases of the machine tool industry and related metalworking and machine-designing industries.

From a talk presented at a meeting of the National Machine Tool Builders' Association, 2071 E. 102nd St., Cleveland, Ohio.

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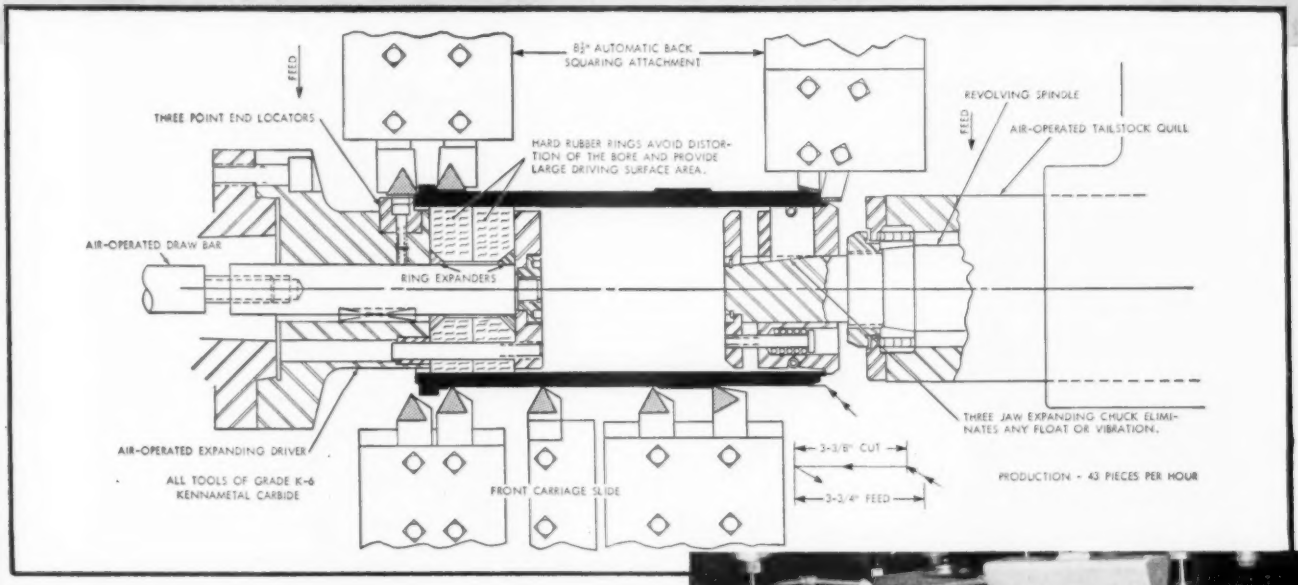
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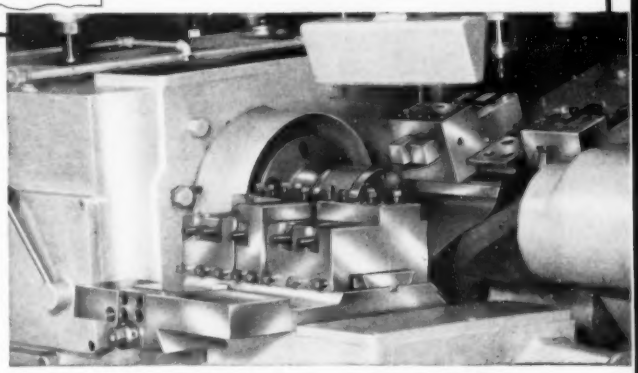
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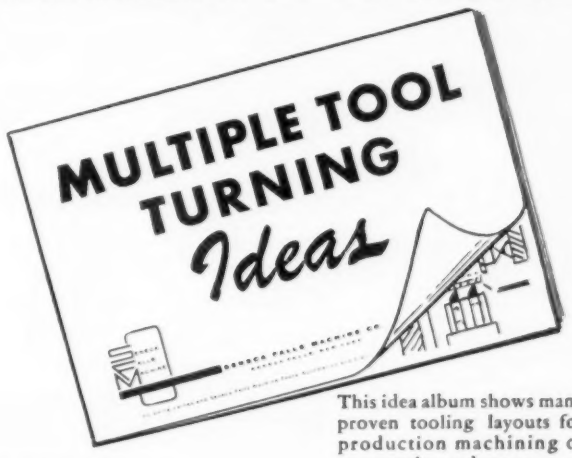


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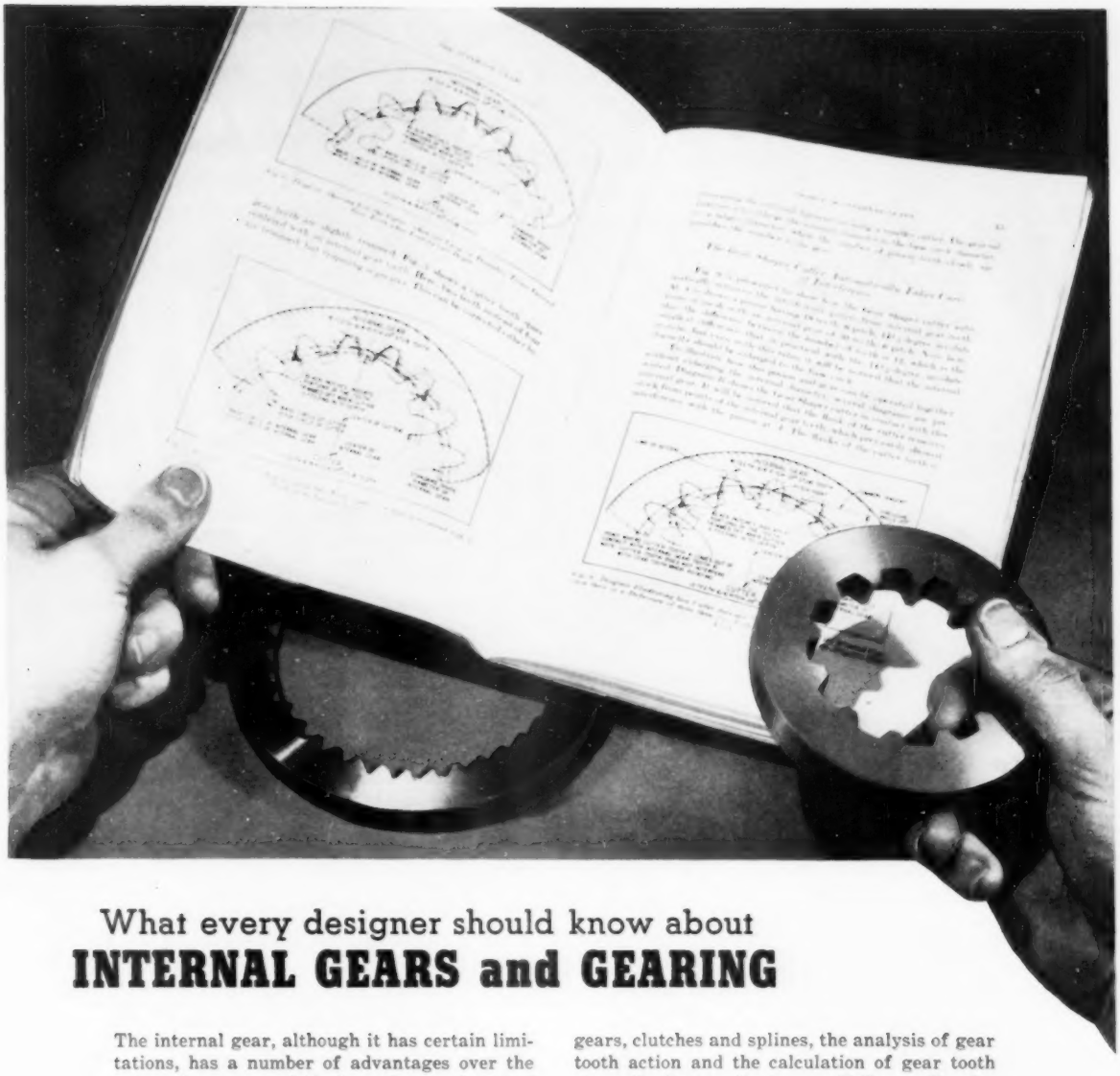
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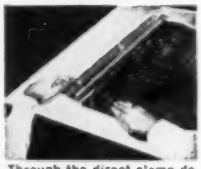
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Your prints "glide" into place. Plan holders are retained from end-to-end, with no chance of bending or springing. Eye-easy indexes provide you with rapid reference.

All-steel Gliders, finished in a handsome grey, harmonize with modern office equipment. Extensions are available.

For longer print "life" and for efficiency, durability and economy in vertical filing, specify Glider. Order now through the best office suppliers or write for illustrated literature.

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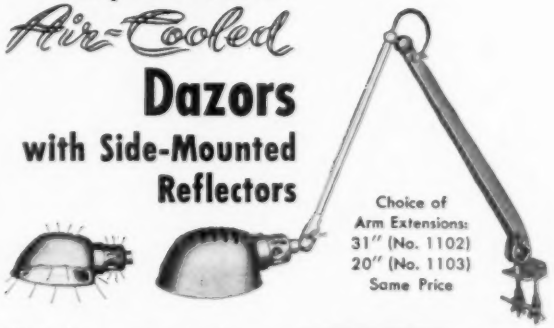
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For Hard-to-Light Machines . . . New Adjustable-Arm

Air-Cooled

Dazors

with Side-Mounted Reflectors



Choice of Arm Extensions:
31" (No. 1102)
20" (No. 1103)
Same Price

Now it's as easy to beam light into a recess, or around an offset, as onto a simple tool or bench position. This Adjustable-Arm Dazor with side-mounted reflector offers same low-cost air-cooled efficiency and positive tension control as top-mounted style. Uses 60-w bulb. Call your Dazor distributor. Dazor Manufacturing Corp. St. Louis 10, Missouri.

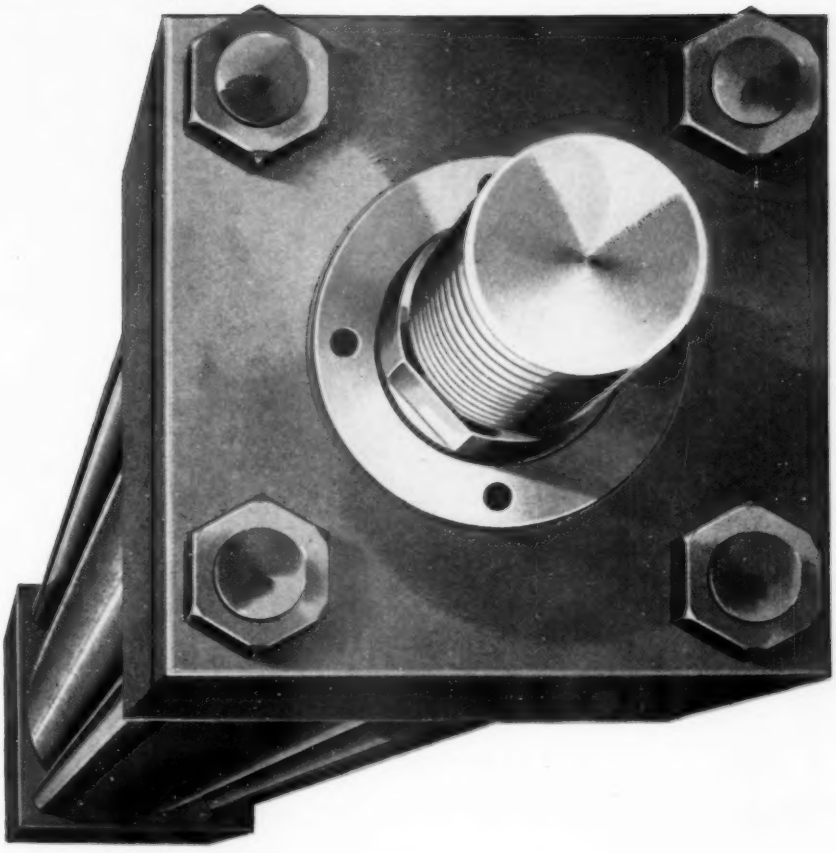


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DAZOR FLOATING LAMPS

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AT YOUR REQUEST...



ANKER-HOLTH

Hydraulic Cylinders now available in Square Head design

Positive Trouble-free Performance

Anker-Holth Division, for 18 years designers and manufacturers of quality air and hydraulic power cylinders, now offers a standard line of all steel, high pressure square head tie rod cylinders. Important new operating features and design achievements assure positive controlled power for a wide range of industrial applications.

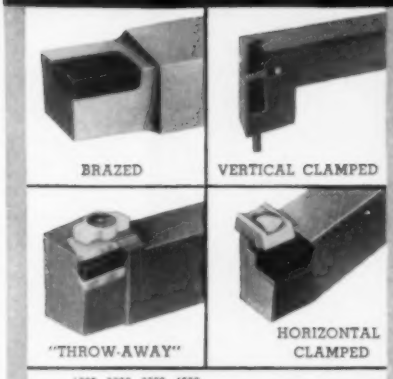
Standardized Mountings for Interchangeability

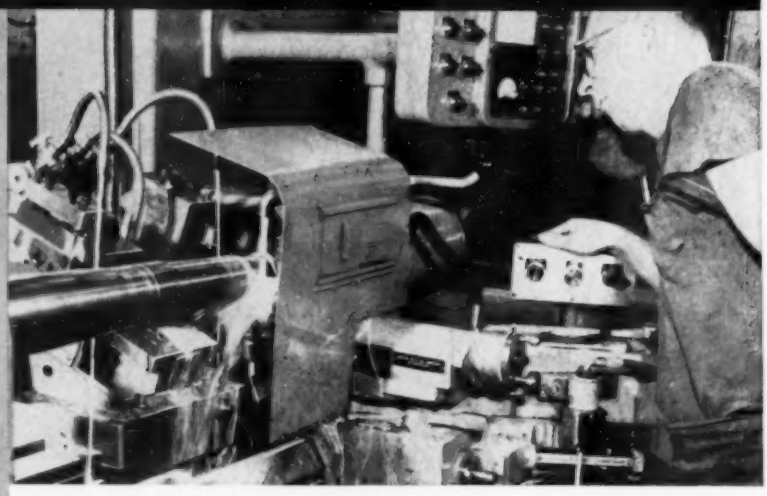
Conservatively rated at 2000 P.S.I. working pressure and 3000 P.S.I. non-shock pressure every cylinder is proof tested at 4500 P.S.I. All mountings are available, standard bores from 1½ to 8 inches. Standardized mountings provide complete interchangeability with most makes of square head cylinders. The Anker-Holth "□" line meets all J.I.C. specifications.

For more information contact your local Anker-Holth representative or Anker-Holth Division, Port Huron, Michigan. YUkon 5-7181

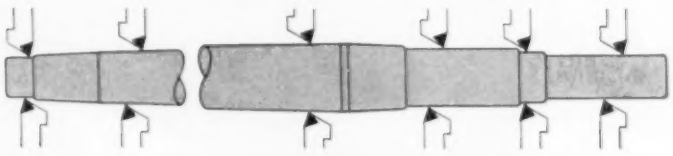
ANKER-HOLTH DIVISION
THE WELLMAN ENGINEERING COMPANY
2730 CONNOR STREET, PORT HURON, MICH., U. S. A.

Caterpillar REG. U.S. PAT. OFF. Tractor Co. gets results . . . with Talide S-92





Caterpillar REG. U.S. PAT. OFF. Tractor Co., leading producer of tractors, diesel engines, motor graders and earthmoving equipment, has been using cost-cutting TALIDE tools for over 10 years to produce parts. Typical example of savings obtained is illustrated below:



CRAWLER TRACTOR AXLE SHAFT

Part . . . . . Crawler Tractor Axle Shaft

Material . . . . . SAE 8645 Steel Forging 3¼" dia. x 38½" long, 3.6mm Brinell Hardness.

Operation . . . . Rough turn all diameters, form tapers, shoulders, and steps.

Machine . . . . . Monarch Mona-Matic No. 21 Tracer Lather, size 54".

Tools . . . . . 12 Talide TB-164 ½" I.C. Triangular TALIDE Throw-Away Inserts mounted in Klamp-Lok Toolholders, Grade S-92.

Depth of Cut . . ⅜"

Feed . . . . . 6" per min.—.018 F.P.R.

Speed . . . . . S.F.M. 387—R.P.M. 340

Coolant . . . . . Soluble Oil and Water

Results . . . . . TALIDE Grade S-92 turned 7 shafts per corner per grind for total of 42 shafts per grind. Inserts were ground an average of 6 times and produced a total of 294 shafts over life of insert. Next best premium carbide grade produced 235 shafts.

Call in a Talide sales engineer to recommend proper tooling for your machining operations, or write for 76-page catalog No. 57-G. METAL CARBIDES CORPORATION, 6001 Southern Blvd., Youngstown 12, Ohio.

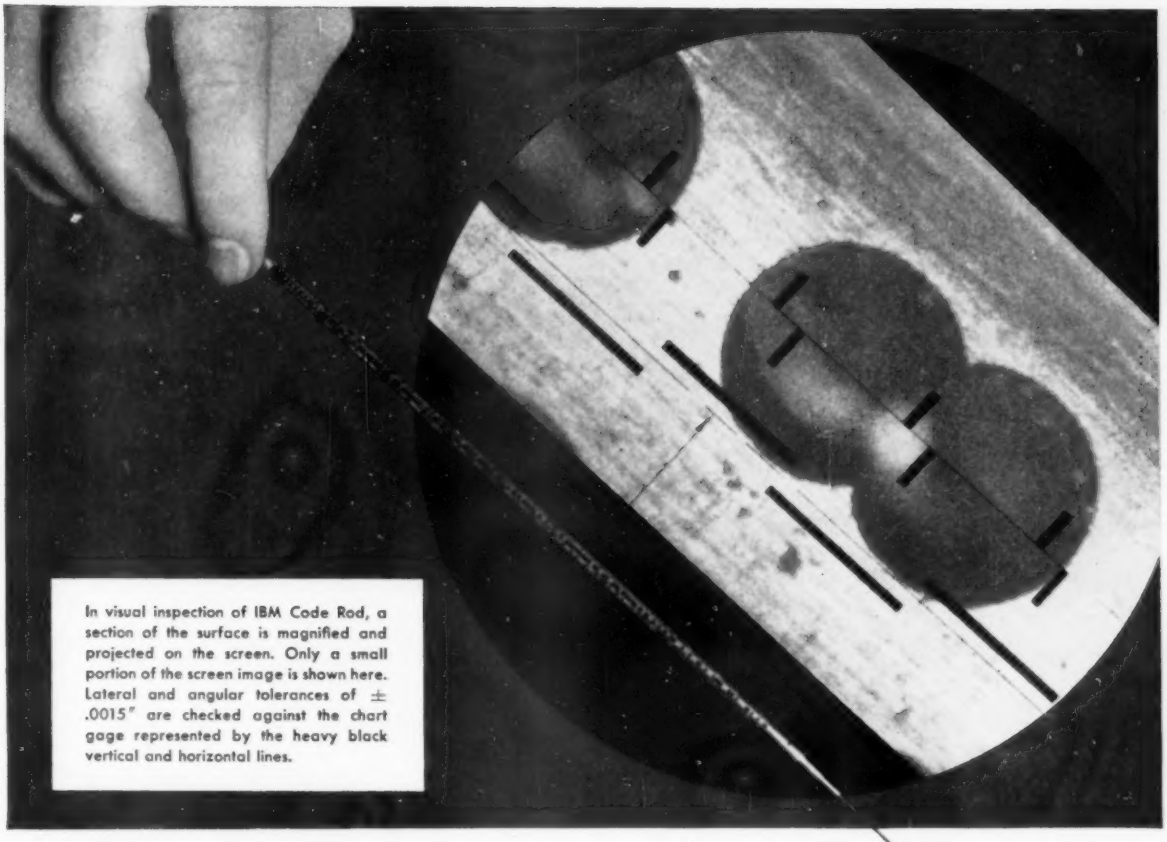


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TALIDE®
YOUNGSTOWN 12, OHIO

HOT PRESSED AND SINTERED CARBIDES • VACUUM METALS
HEAVY METAL • ALUMINUM OXIDE • HI-TEMP. ALLOYS
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY



In visual inspection of IBM Code Rod, a section of the surface is magnified and projected on the screen. Only a small portion of the screen image is shown here. Lateral and angular tolerances of ± .0015" are checked against the chart gage represented by the heavy black vertical and horizontal lines.

How would you gage these 1,118 holes?

Here's how IBM did it... and smashed an inspection bottleneck

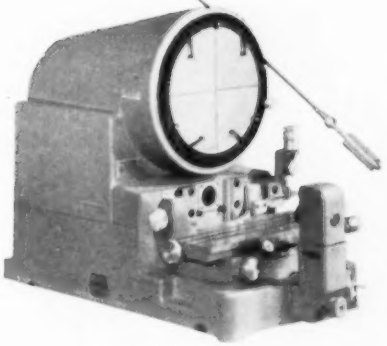
Here's how International Business Machines Corporation boosted the inspection rate on its new Code Rod from 1 or 2 *per day* to 15-20 *per shift*—keeping pace with production, yet maintaining complete accuracy—with a Kodak Contour Projector, Model 14-2A.

The Code Rod is used with the new 720 High Speed Wire Printer, developed by IBM to overcome the speed limitations of conventional bar type printers. The rod is a stainless steel tube with no less than 1,118 1/32" holes. The holes are drilled in various combinations at 7 different intervals in 7 straight rows down the 8" length of the tube. Obviously the inspection problem is of no small proportions.

Lateral and angular tolerances for the holes are ± .0015". *To maintain these tolerances is critical because any mis-drilled holes would cause an error in the shape of the characters to be printed.* What's more, the 720 Printer operates at extremely high speeds, and any slight error could affect its operation.

In visual inspection a master Code Rod is placed next to the rod to be inspected. Both surface images are projected on the screen. The operator simply indexes the image along simultaneously, so that he always has a correct rod in view for comparison of the hole grouping. He checks tolerances by a chart gage on the projector screen.

Got an inspection bottleneck at your plant? Optical gaging with a Kodak Contour Projector may well be the answer. The booklet "Kodak Contour Projectors" gives examples of how other firms are profitably using Kodak Contour Projectors, plus full data on the various models we offer. The booklet is available on request from:



Kodak Contour Projector, Model 14-2A, is a versatile precision measuring instrument for production lines or toolroom. It is one of 6 Kodak Contour Projector models available to meet all your optical gaging needs. Operators work in complete comfort, need little training.

Apparatus and Optical Division

EASTMAN KODAK COMPANY, Rochester 4, N. Y.

the KODAK CONTOUR PROJECTOR

Kodak
TRADE MARK

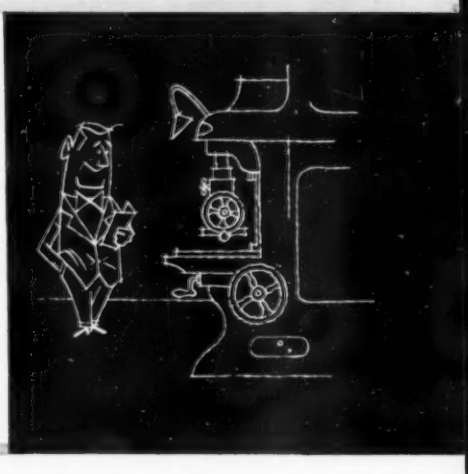
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SEE all the very latest advancements and improvements in more than thirty major categories of industrial products.

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ATTEND top level conferences, conducted by recognized authorities on the newest production techniques and developments.

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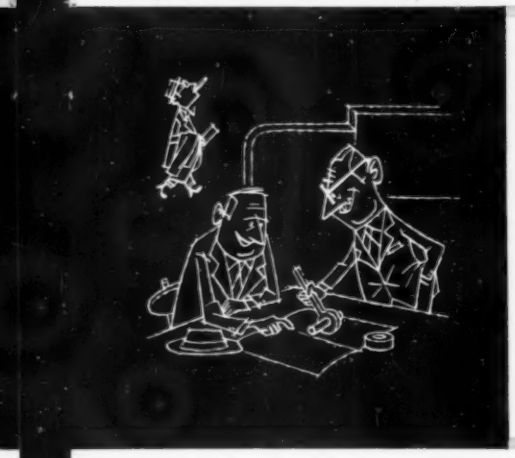
**Symposium*

MEET and exchange ideas with management, engineering, production, sales people from the nation's leading industrial concerns.

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INSPECT the modern equipment and up-to-the-minute manufacturing methods being utilized in booming Delaware Valley plants.

Yes, you'll have an opportunity to see industry in action, too, because arrangements have been made for 28 tours through Philadelphia area plants . . . including the U.S. Navy Yard.

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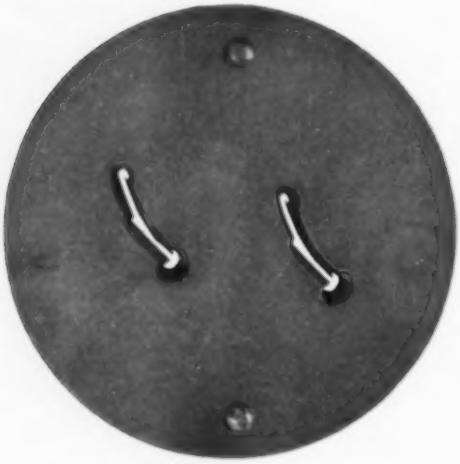
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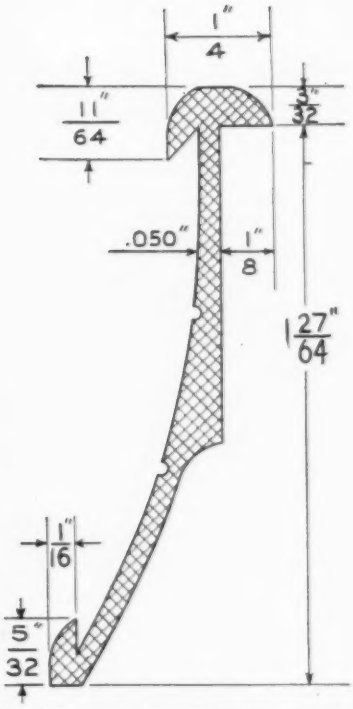
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AMERICAN SOCIETY OF TOOL ENGINEERS

TOOL SHOW CONFERENCE '58 MAY 1 TO 8

Only Carpenter Aluminum Extrusion Die Steel Discs Can Offer You Such Positive Assurance of Internal Soundness





MEL-TROL makes the difference

Aluminum extrusion die life up 40%

Heat checking eliminated

This die is used to extrude intricate shapes from aluminum billets. Pressure involved: 1000 tons.

And it's a typical example of how forged discs of Carpenter No. 883 (A.I.S.I., type H-13) die steel . . . plus, Carpenter's exclusive MEL-TROL quality . . . pays off with measurable improvements on the job.

With the steel previously used, the thin unsupported sections either broke or bent under extruding pressure. Premature heat checking was also a headache. And certain sections of the shape had to be held to tolerances of ± .012".

In addition to the four improvements mentioned above, the change to Carpenter No. 883 gave these additional benefits: Preheating has been eliminated. And the die face can be peened at a Rockwell hardness of C-50-52

No preheating in hardening required

Readily peened without chipping

without danger of chipping.

Forged discs of Carpenter No. 883 and its companion aluminum extrusion die steel No. 345 (A.I.S.I., type H-12) offer you outstanding toughness and ductility to resist wear . . . resist cracking . . . give longer die life. They can be air hardened with minimum scale, decarburization and distortion . . . easily adjusted by peening or filing.

Both grades are upset forged and produced exclusively by MEL-TROL — the patented process that eliminates center weakness — most common cause of die failure.

Order today. Complete stocks of No. 883 and No. 345 forged discs — in a wide range of sizes — are available for fast delivery from your nearby Carpenter Mill-Branch Warehouse, Office or Distributor.

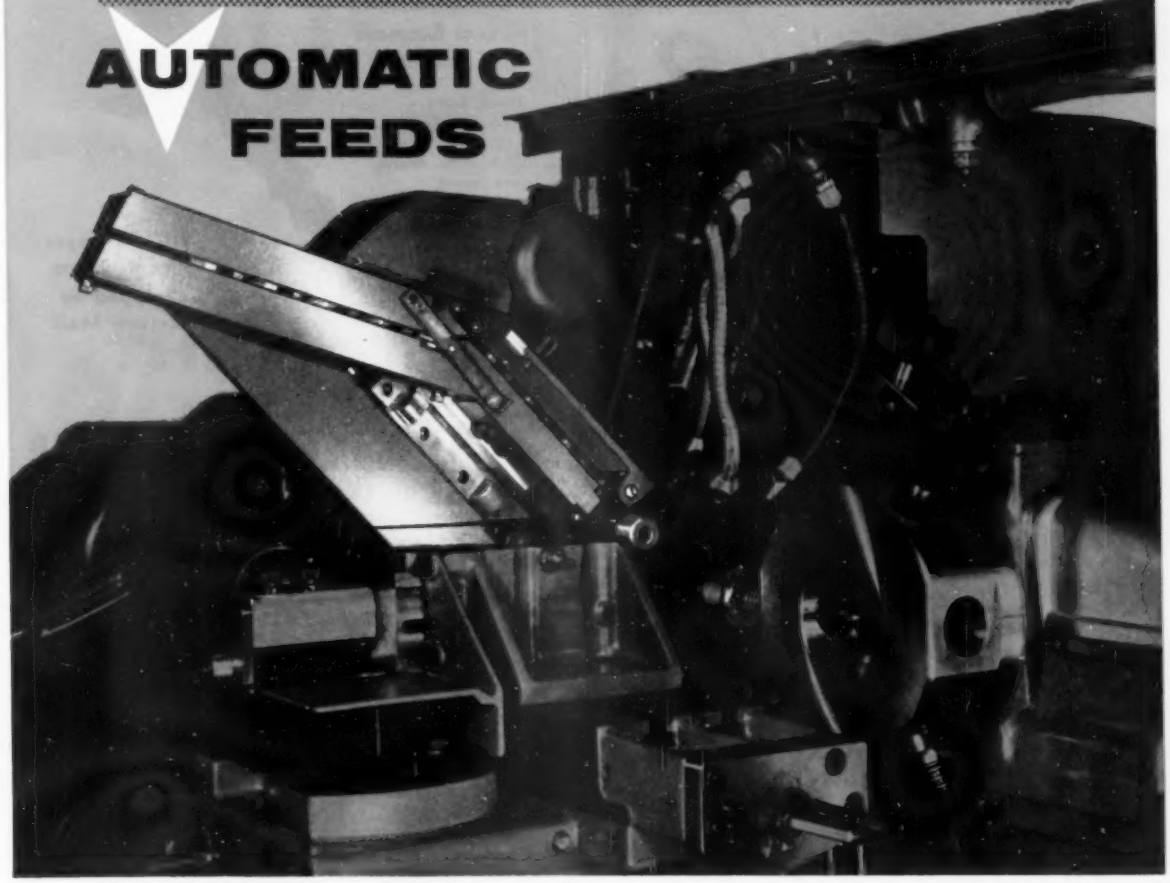
Carpenter STEEL

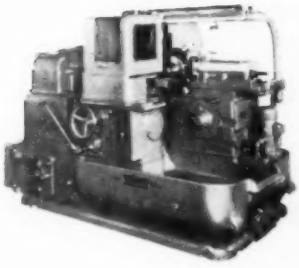
The Carpenter Steel Company, 154 W. Bern St., Reading, Pa.
Export Dept.: The Carpenter Steel Co., Port Washington, N. Y.—"CARSTEELCO"

Specialty steels for the aluminum extrusion industry

TAREX

AUTOMATIC FEEDS





AUTOMATIC FEEDS of various types can be easily applied to TAREX Automatics as they are designed to mount feeds in almost *any* position . . . including the front and rear slides or in the oblique position; also at the rear of the turret as well as to feed parts through the headstock.

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*Vulcanaire equipment pays for itself on the first job.

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Vulcan's 41st Year

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VULCAN tools

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BUILT-IN
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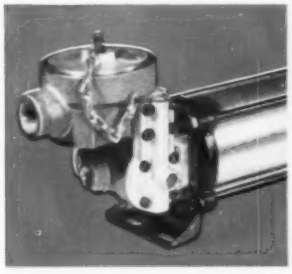
BUILT-IN
DUAL SPEED CONTROLS

REQUIRES ONLY A
SINGLE AIR CONNECTION

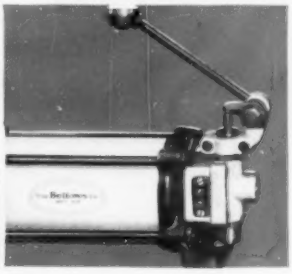
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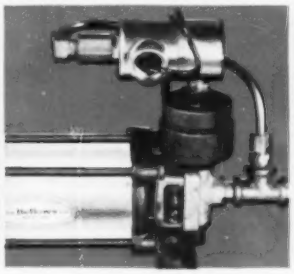
CHOICE OF BUILT-IN VALVES



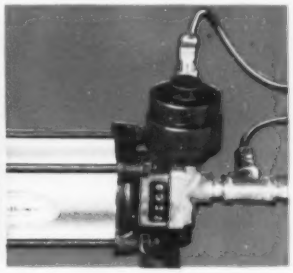
115 V. ELECTROAIRE VALVE
For J.I.C. applications where a 115 v. momentary contact is desirable.



MECHANICAL VALVE
For manual operation or for use with cams or direct linkage.



115 V. MAINTAINED CONTACT
Valve remains in shifted position during period current is applied.



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For use in applications calling for full pneumatic control.



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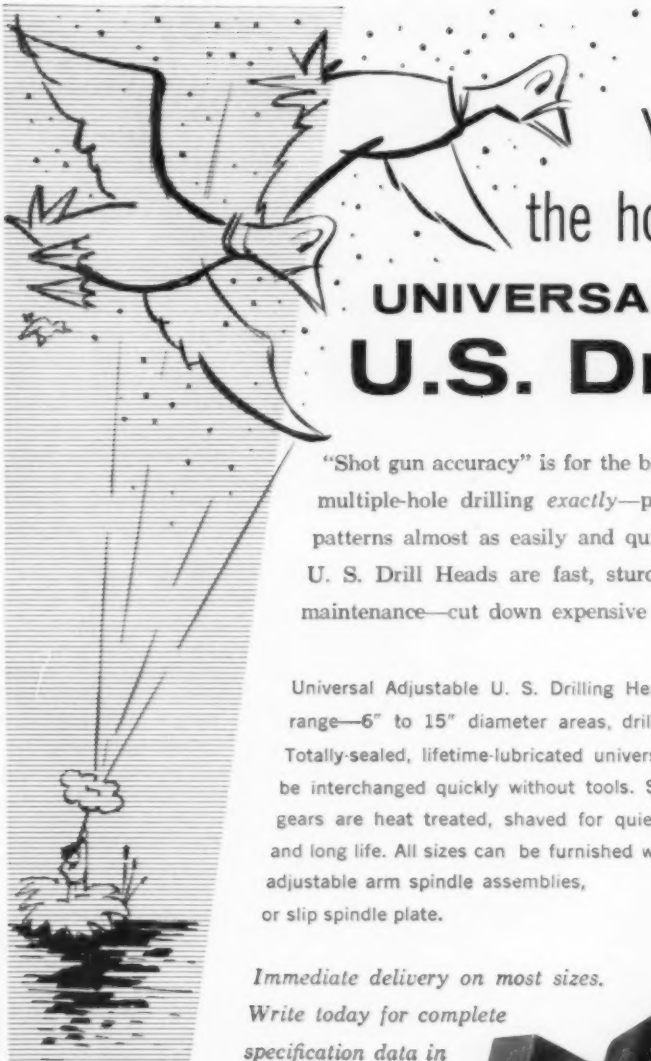
Fifty pages of data to help you select the right Air Motor-Valve combination for your job. Address Dept. TE-158, The Bellows Co., Akron 9, Ohio. In Canada: Bellows Pneumatic Devices of Canada, Ltd., Toronto 18. Ask for Bulletins BM-25 and SP-55.

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983-B



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UNIVERSAL ADJUSTABLE

U.S. Drill Heads

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We manufacture all types of adjustable, fixed center and individual lead screw tapping heads. Ask us to help solve your multiple drilling and tapping problems.

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The shorter the distance the less cost. Butterfield taps save time and cut your product costs — giving higher production and quality products with Butterfield tools.

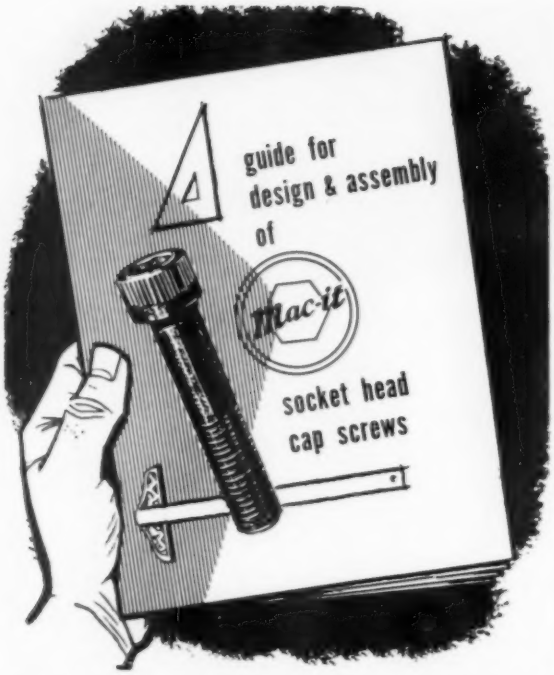
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MAC-IT hex socket / alloy cap & set **SCREWS**

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Drawers in the steel base table roll quietly and smoothly on muffled ball bearing rollers, contributing to the quiet atmosphere of the drafting room.

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SPINDLE SPEEDS 150 and 250 RPM Other Spindle Speed Pulleys Available



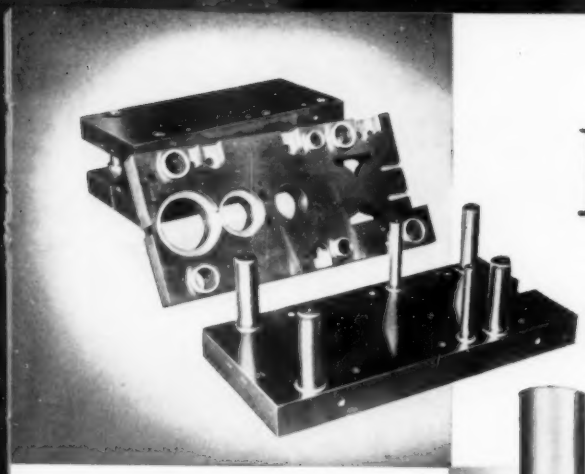
MODEL B943 MOTOR DRIVEN WORK HEAD

No. 11 B & S Tapered Spindle Standard Equipment. No. 12 B & S or No. 5 Morse Available at Slight Extra Cost.

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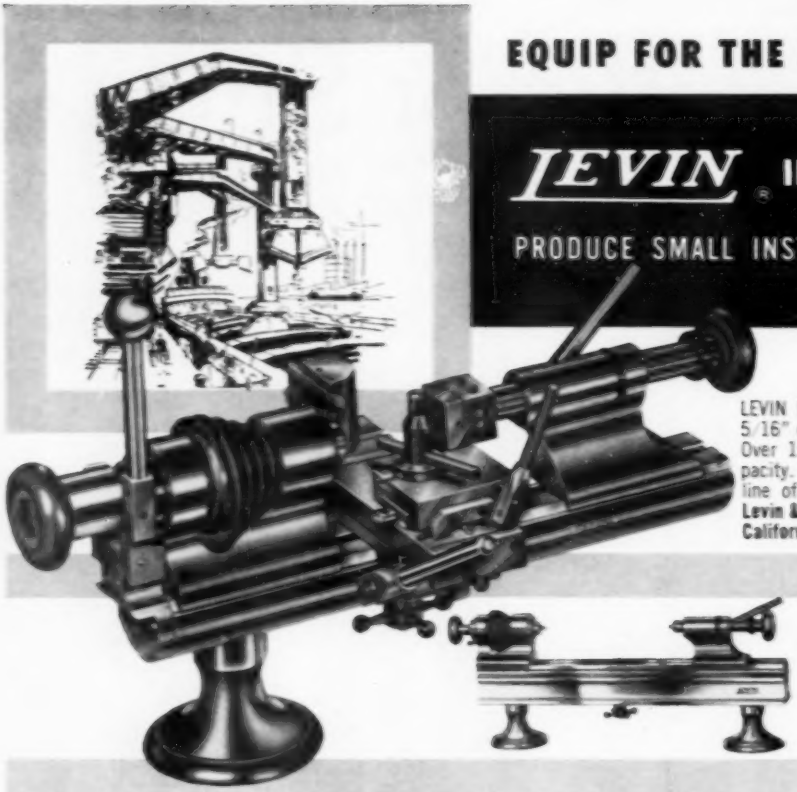
DIE SUPPLY DIVISION

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LEVIN lathes are made in two collet capacities, 5/16" or 3/16", and thirty-three different models. Over 150 sizes of collets available in either capacity. Send for catalog "M" describing complete line of instrument lathes and accessories. **Louis Levin & Son, Inc., 3610 S. Broadway, Los Angeles 7, California.**

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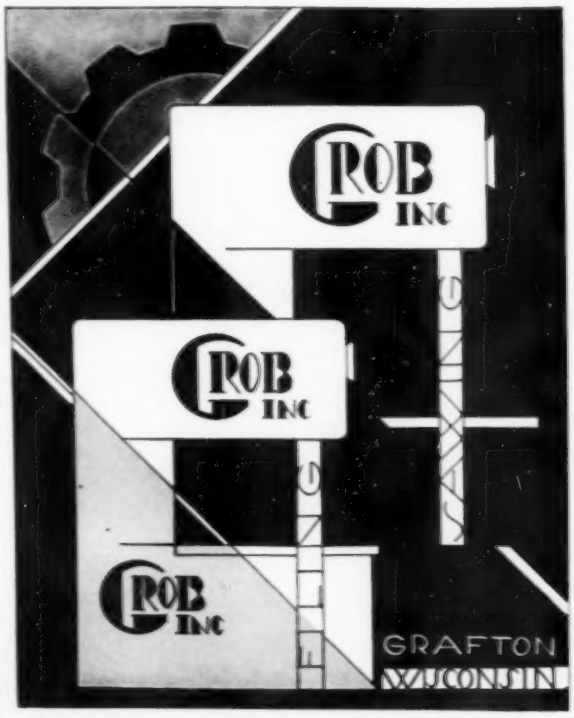
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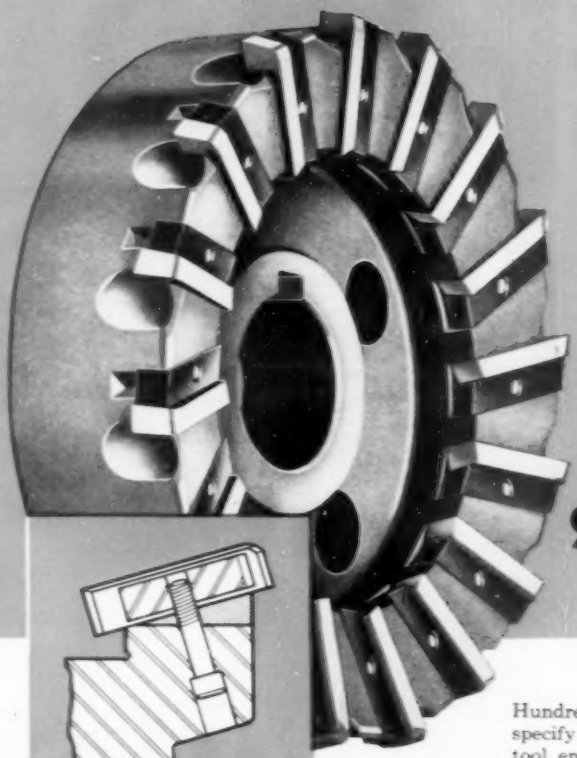
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SUPER IBH CUTTER

For aluminum, steel, most other metals. All the features of our HBH Cutter except

- Blades are at 10° positive angle to radius.
- Number of blades is diameter ÷ 2.

For efficiency, select the correct grade of carbide for the metal, grind to the proper angle. Your Super IBH Standard Cutter will do the rest!

Hundreds of tool men everywhere tell us willingly *why* they specify Super HPH and IBH Standard Milling Cutters. As a tool engineer, machinist or tool buyer you'll value these *reasons* why many shops have worked Super cutters for over ten years, always with economy and quality.

Here's why: For high speed machining of cast iron, malleable iron or brass, our HPH cutter has big *solid* carbide blades for maximum strength and elimination of braze strains. Blades are set radially, the number being the diameter x 2. You sharpen with a minimum removal of carbide—not the ⅛" you lose with serrated-back blades—as Super blades can be moved a few thousandths or less at a sharpening. Then after scores of sharpenings, you use the carbide down to a stub because our wedge (with a filler-blade) gives you a locking area the complete length of the slot. The blade is solid as though part of the body itself since there are no back-up screws. If a wreck occurs—as it may in the best of shops—only the wedge is damaged or scrapped, not your cutter body. There are no threads in the body to strip as our wedges are tapped to take locking screws let in from the back.

The Super cutter body is #4130 Steel, heat treated for optimum strength. Drift pockets are machined under wedges for quick removal or adjustment. Mounting is versatile; it may be bolted on a #50 NMTB mount and it also has a keyway and ground bosses for arbor mounting.

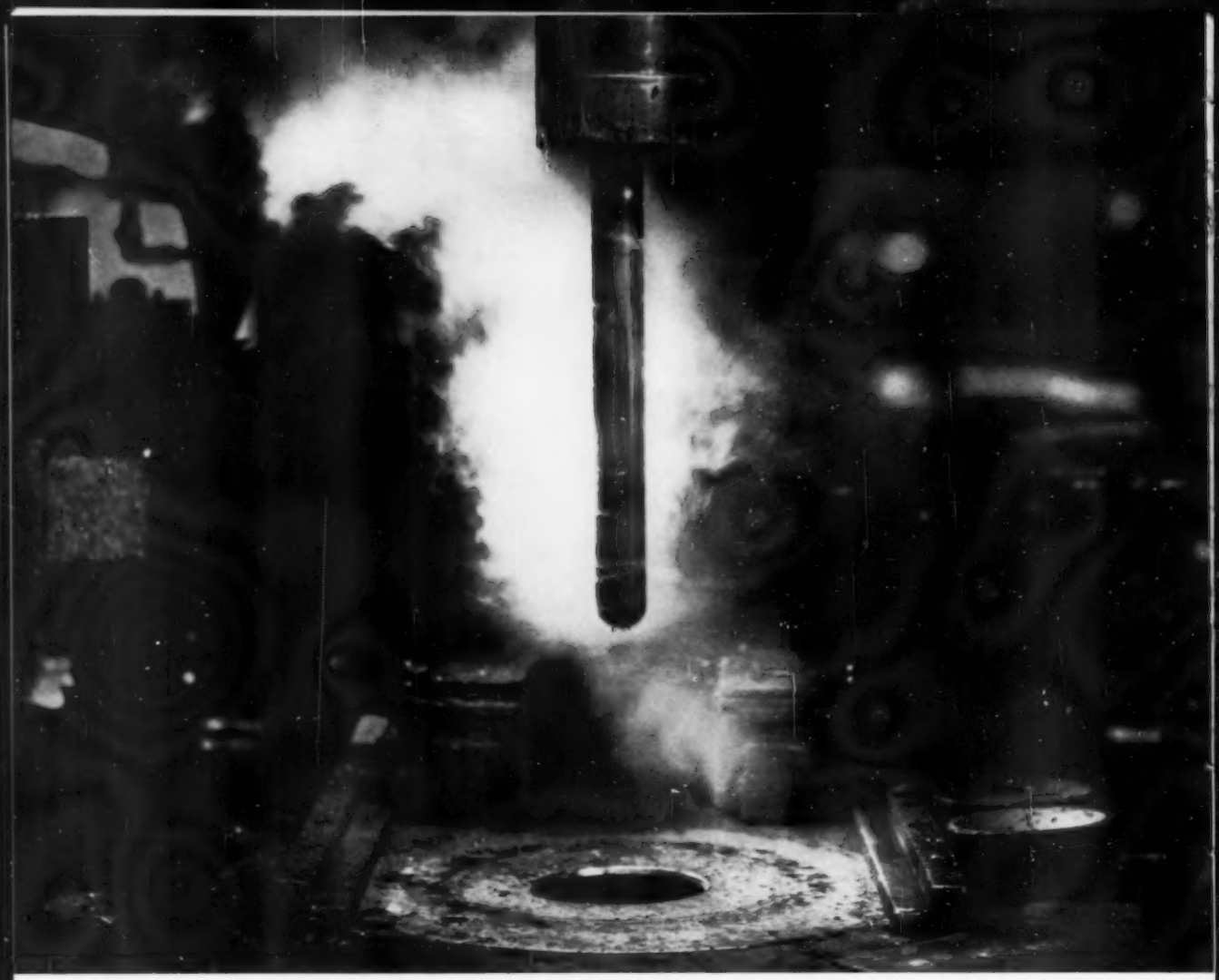
Why not write for our complete catalog of solid and carbide tipped tools and the name of our stocking distributor near you. Thousands of satisfied tool buyers *must* be right; we'd like to have you join them.

Super TOOL COMPANY

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Subsidiary of Van Norman Industries, Inc.



Tough 2½" diameter mandrel at Rc 44 on 1150 ton brass extrusion press. Scovill Manufacturing Co.

Mandrel of HALCOMB 218 retains toughness and hardness at hot work temperatures...

This mandrel is made of Halcomb 218—a tough, air-hardening hot work steel. Halcomb 218 is suitable for tools like this which require a higher degree of toughness at moderately elevated temperatures than is obtainable with the tungsten types of hot work steels. And Halcomb 218 *retains both* its hardness and strength at these temperatures.

For example, at a hardness of Rc 44, Halcomb 218's Charpy Impact Strength is 33 ft-lbs at 500F. And it will retain this hardness after 1 hour, after 10 hours and even after 100 hours at temperatures up to 900F.

Properties like these cut tooling costs. The mandrel shown above is good for 1200 pushes, for example, and even then all it needs, usually, is repolishing before being used again.

Halcomb 218 is particularly useful for all hot work operations on which drastic coolants are used. It even resists breaking very successfully when water cooled in operation. If these sound like advantages you can use, call your local Crucible representative for more complete data. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

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A Mohawk SUBLAND ..... NATURALLY!!

Mohawk Sublands are the modern, practical answer to faster, more accurate and economical drilling of multiple diameter cavities.

One Mohawk Subland drill will outwork and outperform two, three, four or more ordinary step type drills . . . and do the job better.

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Write, wire or 'phone today for your free copy of the big illustrated brochure Sublands vs Step tool operations. It's yours for the asking . . . and if you're interested in combination drilling operations, you'll find dozens of ways to save your equipment dollars.

NORMAL DELIVERY ON MOHAWK SIZE-OPTIONAL SUBLANDS TEN DAYS FROM RECEIPT OF ORDER!

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Because of his laboratories and know-how the leader can give you better design. The leader can afford more efficient tooling and greater quality control.

The leader can give you a better cylinder without a premium price.

The leader in air and hydraulic cylinders is Hannifin.

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POWER CYLINDERS

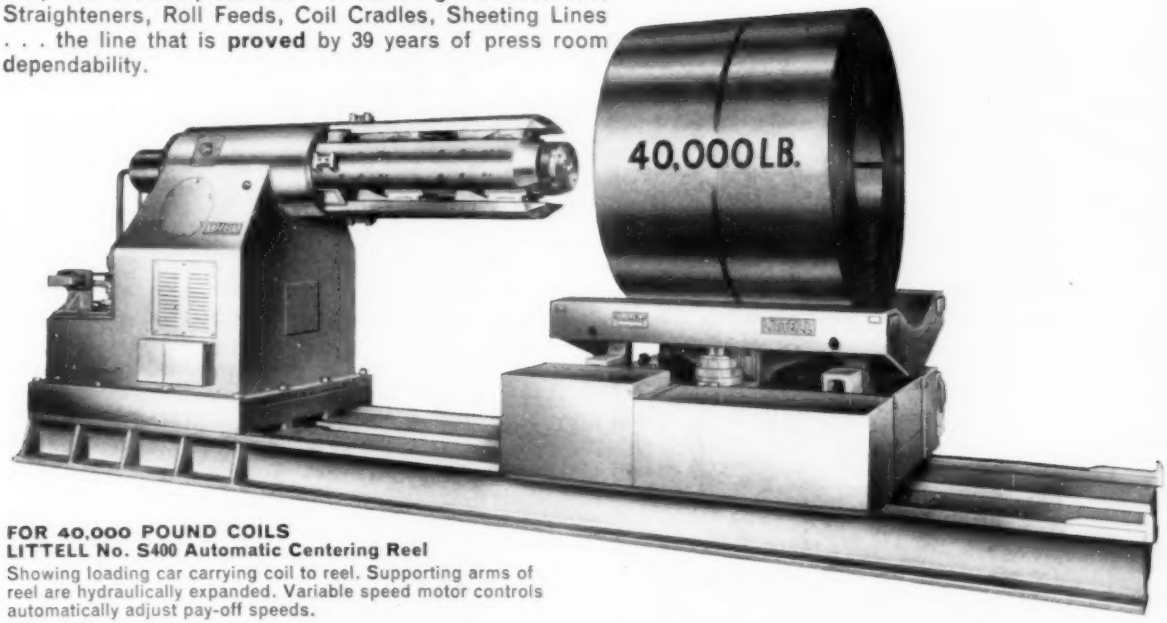
Write for your copy of this new Hannifin Cylinder File—complete, easy-to-use, easy-to-order-from information on five lines of Hannifin cylinders. Hannifin Company, 519 South Wolf Road, Des Plaines, Illinois.



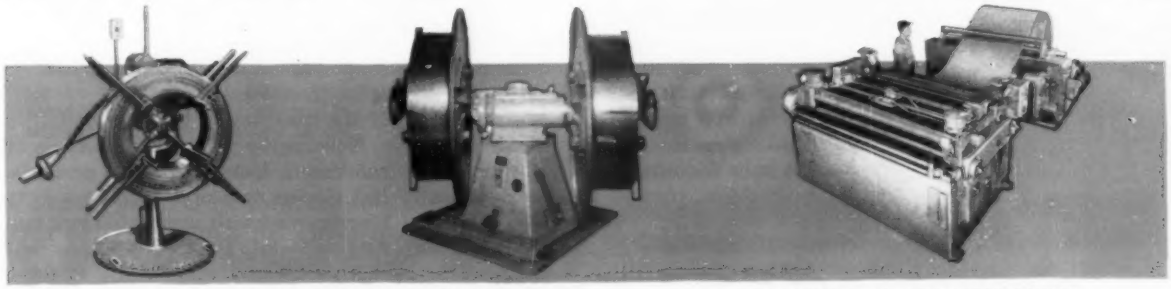
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INCLUDES REELS FOR 100 LB. TO 40,000 LB. COILS

Your Littell Reel is easy to load. It holds the stock secure, and unreels it smoothly, with controlled action. You can depend on accurate pay-off to automatic feeding equipment, or to press, shear or slitter. For Littell Reels are part of the complete Littell coil handling line . . . Hooks, Straighteners, Roll Feeds, Coil Cradles, Sheeting Lines . . . the line that is **proved** by 39 years of press room dependability.



FOR 40,000 POUND COILS
LITTELL No. S400 Automatic Centering Reel
Showing loading car carrying coil to reel. Supporting arms of reel are hydraulically expanded. Variable speed motor controls automatically adjust pay-off speeds.



FOR 100 TO 1000 LB. COILS
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These smooth-running, ball bearing, Automatic Centering Reels uncoil stock or wind scrap. Reversible motor.

FOR 2500 POUND COILS
LITTELL No. 25-12 Double Plain Brake Reel
Keeps one coil in reserve as it unreels stock. Easily swivelled to lock the reserve coil in unreeling position.

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Straightens and feeds stock .125" thick x 72" wide at speeds up to 180 f.p.m. Driven through hydraulic drive transmission by a 25 h.p. motor.

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District Offices: Detroit, Cleveland
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LITTELL CATALOG 56 gives details on the complete Littell line—write for your copy.

Any similarity to a real-life company is purely intentional



How do they keep their cotton-pickin' fingers clean in Cincinnati?

The folks at the Fluffy Stuff Company like any color as long as it's *white*.

When they celebrate, they paint the town white. When they do most anything, they do it up white . . . to the hilt.



They have a white complex. It figures, though. They process cotton. And to be acceptable, their products must have the hue of a polar bear in a snowstorm.

So all was consternation one day, let us tell you, when rust-stains were found on some cotton batting! The air turned blue. Faces became red.

And a search was started to find the culprit. Everybody joined the posse.

Turned out it was a semi-steel spider ratchet in a machine for drying and breaking-up matted cotton batting. It not only deposited, you'll pardon the expression, rust — but some of its spokes or fingers were broken to boot.



But all was not lost. Seems like one of Fluffy Stuff's maintenance men had heard about Ampco Metal, a whole series of special copper-base alloys. (Read some of our ads, we hope.)

At any rate — to make a long story short — the company investigated Ampco Metal. Thought it looked like it had possibilities. Tried it.

At last report, Ampco Metal had not only provided freedom from rust — but it actually had lasted five times longer than the previous part!

But that's not all of the story. Fluffy Stuff was also having trouble with a brass rake used to dig up wet cotton as it passed through a washing machine. The rake had fingers 8" long x 1" wide x ½" thick.



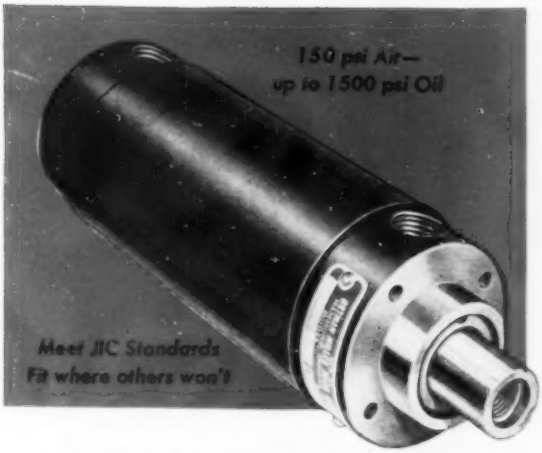
F. S. had a replacement made of Ampco Metal — and it lengthened the life of the rake fingers by 20 times!

Now maybe you make conveyors or condensers, instead of cotton products. But if wear or corrosion are factors to be concerned with, you should look into Ampco Metal. There's an Ampco field engineer nearby who's ready to focus his attention on your particular problems. Call him.

And write for Bulletin 33. *Ampco Metal, Inc., Dept.* **TE-1,** *Milwaukee 46, Wis. (West Coast Plant: Burbank, Calif.).*

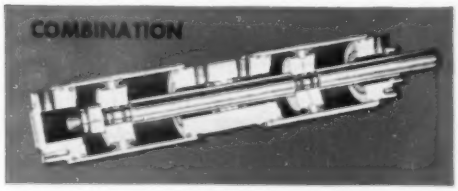
AMPCO® METAL

The metal without an equal

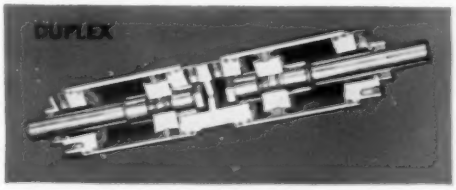


O-M Design Assures Maximum VERSATILITY

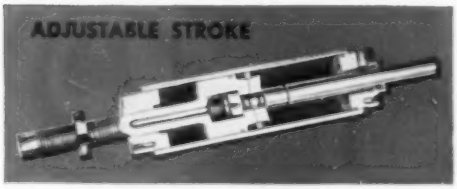
The O-M Internal key-type cylinders are not only the most compact, streamlined and efficient cylinders on the market today; but they also easily lend themselves to modification. Using a majority of standard parts and one or two semi-standard parts, you get the advantages of "special" cylinders designed to do your job better at a very nominal extra over standard cylinder prices. Here are only a few of the combinations available.



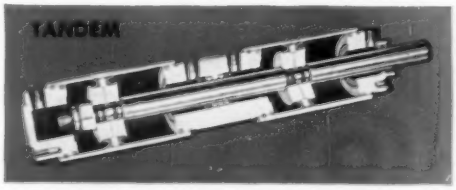
The economy and ease of air operation can be teamed up with the precision of hydraulic speed control. This can be accomplished with the O-M Air-Hydraulic combination cylinder by merely metering the oil flow between the ports of the forward cylinder of the unit.



The duplex cylinder is "just the ticket" for the application where movement takes place in opposite directions in the same plane. Both piston rods may be extended or retracted simultaneously, or independently. Also available with common center port.



Often it is necessary to make frequent changes in stroke length on the same or different jobs on the same machine. This adjustment is easily accomplished with micrometer accuracy in only a moment's time.



When diametrical space is at a premium and the available pressure of the operating medium is low, the force can be almost doubled by the use of the tandem air or low pressure hydraulic cylinder.

Consult your O-M Representative or the factory for specific recommendations for your application. Use coupon for name of representative nearest you and copies of O-M standard cylinder catalogs.



ORTMAN-MILLER MACHINE COMPANY

13 143rd Street, Hammond, Indiana

☐ Have representative call

☐ Send Bulletins 101A and 105

Name_____ Position_____

Company_____

Address_____

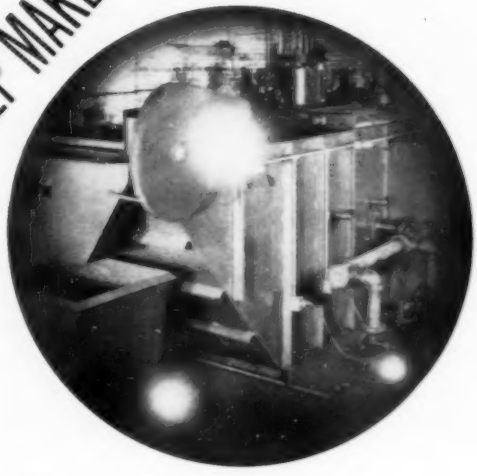
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AT FAFNIR

HOW HOFFMAN FLOTATION UNITS HELP MAKE BETTER BALL BEARINGS



before the installation of money-saving Hoffman Flotation Units in the Fafnir Bearing Co. plant, these were among their coolant clarification problems:

1 — Short wheel life

2 — Part rejects

3 — Daily cleaning of each machine

4 — Dirty machines with resulting bacterial odor

after the changeover to a central system in the Fafnir Bearing Co. plant and the utilization of Hoffman Flotation Units, these changes took place:

1 — Extended wheel life

2 — Improved quality, uniformity of parts

3 — Reduced machine clean-up time

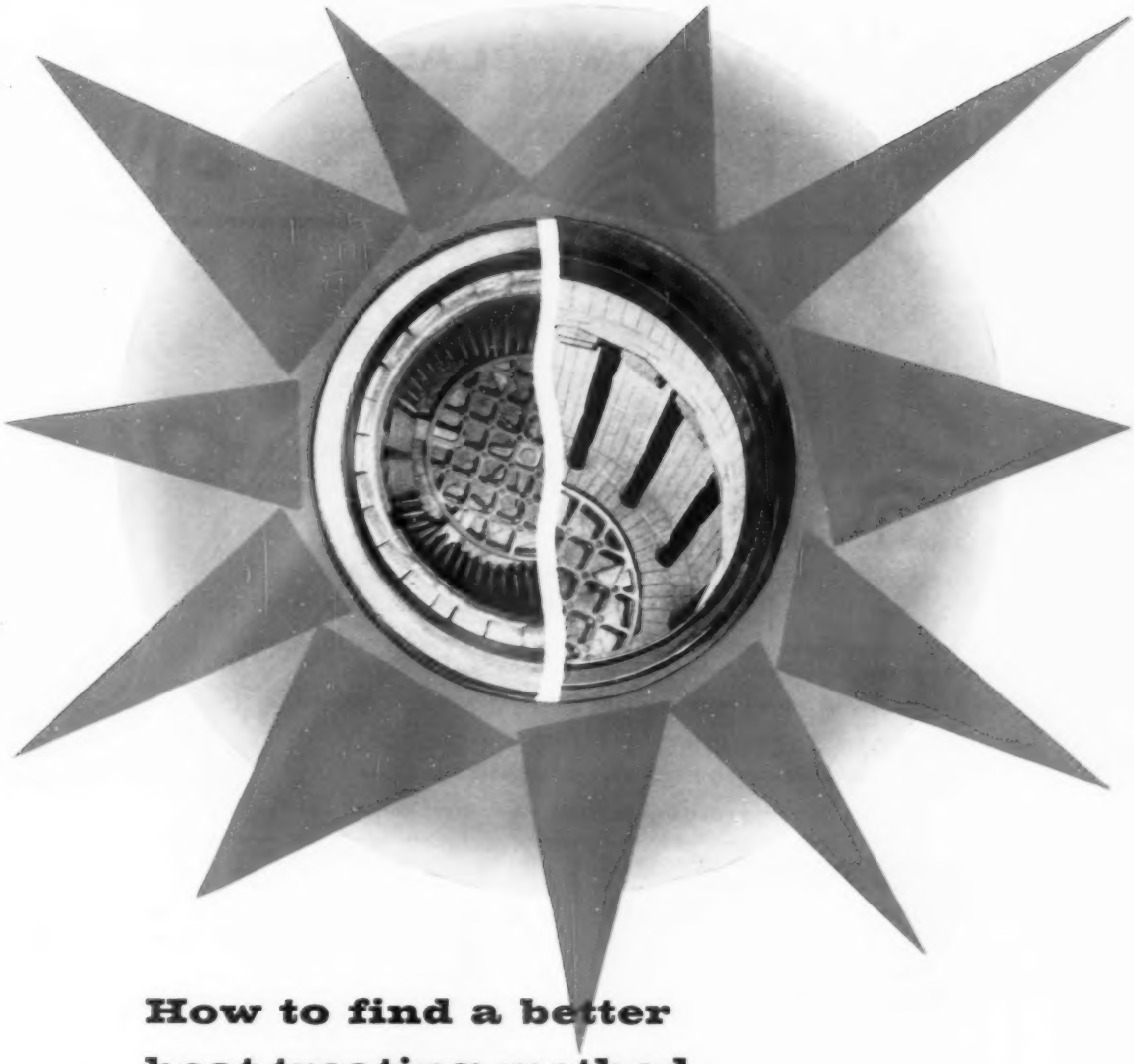
4 — Bacteria and resulting odor eliminated

HOFFMAN FILTRATION SYSTEMS custom designed for your needs

Call your Hoffman representative or write for Bulletin A690 for further information

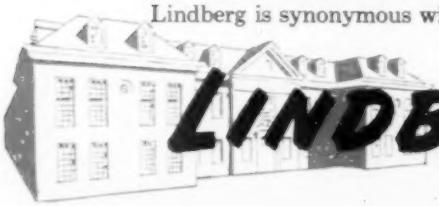
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Here's a sound way to do it. Take your problems to the people who have consistently, over the years, provided the metal treating industry with new and better ideas, more efficient, more practical equipment. This will bring you to Lindberg, creators of the famous Cyclone type atmosphere furnaces, the long-life "dimple" vertical radiant tube, the revolutionary new CORRTHERM electric heating element and so many other innovations in better heat treating methods. Lindberg is synonymous with heat treating furnaces. We build them for carbonitriding, carburizing, hardening, tempering, normalizing, bright stainless annealing, brazing, carbon correction, nitriding, or any other metal treating requirement. Give your production processes the advantages of Lindberg's forward look in "heat for industry" techniques. Get in touch with your nearest Lindberg Field Representative (See classified phone book) or write Heat Treating Furnace Division, Lindberg Engineering Company, 2447 W. Hubbard St., Chicago 12, Illinois.



LINDBERG heat for industry

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for tooling applications

Trevarno tooling fabrics are specially designed for fast, low-cost manufacture of reinforced plastic tools and dies. They offer these important advantages:

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- faster easier layup even on complex jigs
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Three basic tooling fabrics are featured: Detail (1P12), General (2P161), and Build Up (2P482). Also available is a complete range of tooling fabrics to meet your individual requirements.

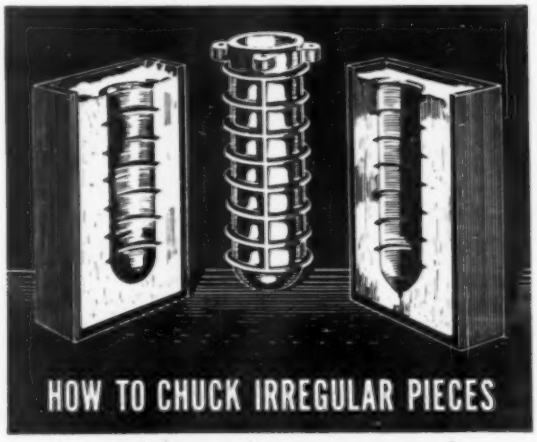
Call or write today for complete literature on quality Trevarno glass fabrics for tooling applications.

COAST MANUFACTURING & SUPPLY COMPANY

P.O. Box 71, Livermore, California • Plants at Livermore, California and Seguin, Texas

Trevarno GLASS FABRICS

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HOW TO CHUCK IRREGULAR PIECES

quickly and inexpensively

It's easy to make chuck jaws for irregular workpieces with Cerromatrix®, the low-temperature melting alloy. Just cast it against the workpiece and you get an accurately fitting pair of jaws. The alloy can be cast against forged metal parts, die castings, rubber, wood and most plastics without burning or warping the piece. A recent development calls for the use of steel balls embedded in the matrix, where the additional surface hardness is required.

Send for Bulletin B5—it tells the whole story.

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To Cut Your Tapping Costs, GRIND and RE-GRIND YOUR TAPS ACCURATELY!

Use these basic hook angles as a starting point for better tapping.

Aluminum	18°	Cast Iron	5°	Brass	5°
Copper	18°	Magnesium	18°	Plastics	8°
Mild Steel	8°	Stainless Steel	12°		

Write for specific details on how the BLAKE Flute and Chamfer Grinders give you the accuracy you need for low tapping costs.

Controlled Grinding of Tap Flutes and Chamfers

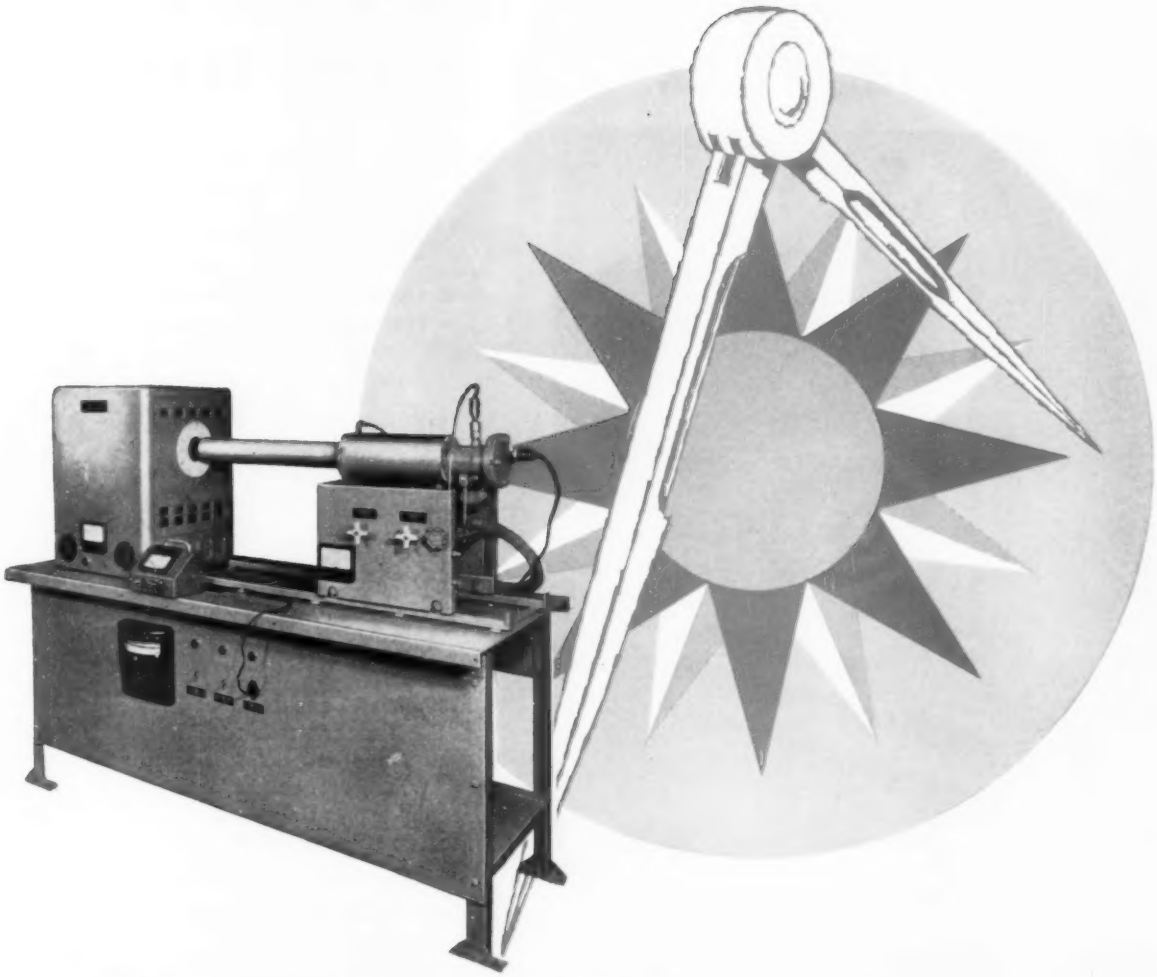
EDWARD **BLAKE** COMPANY INC.

950 CHERRY ST. WEST NEWTON 65, MASS.

USE READER SERVICE CARD; INDICATE A-1-240-3

Capable German factory with trained staff and modern machinery would like to build machine in license and if possible take charge of the distribution at the same time. Offers are requested to be sent to Messrs. Mechanische Werkstätten GmbH., Kirchlengern (Westf.) Germany.

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Pilot Plant Equipment . . .
a Lindberg Innovation

When there is something new in "heat for industry" most often it comes from Lindberg. The latest is a new line of Lindberg equipment now available that fills in a long-felt need in metal treating. Our engineers have designed a brand new group of furnaces to bridge the gap between laboratory and production line. This larger-than-lab, smaller-than-standard equipment is designed specifically for pilot plant use. You can test your materials, your methods, on equipment moderately priced but production capable. Fuel-fired, electric and High Frequency units are included. Six different types of furnaces can be supplied including, as illustrated, an electric vacuum-type furnace ideal for testing this newest and most promising heat treating method. Get in touch with your nearest Lindberg Field Representative (See classified phone book) or write Pilot Plant Equipment Division, Lindberg Engineering Company, 2447 W. Hubbard St., Chicago 12, Illinois.



LINDBERG heat for industry

UNBRAKO STRIPPER BOLTS NOW AVAILABLE WITH THE NYLOK* SELF-LOCKING DEVICE



UNBRAKO STRIPPER BOLTS with the Nylok self-locking device. Nylon pellet locks them with positive, dependable prevailing torque action. Bolts are reusable.



SELF-LOCKING UNBRAKO STRIPPER BOLTS fasten this stripper plate securely. Constant vibration, shock, extended running time will not cause these bolts to loosen.

Self-locking UNBRAKO stripper bolts (shoulder screws) save time, money and headaches wherever they are used. They eliminate the costly, time-consuming checking of bolts to see that they are securely tightened. They protect precision tools and dies from damage caused by vibration-loosened bolts. They assure that your equipment will have longer service life, with reduced maintenance and downtime.

UNBRAKO stripper bolts are manufactured to the highest standards of precision. They are made of heat-treated alloy steel with continuous grain flow lines and have fully formed Class 3A threads finished close to the shoulder for maximum strength and holding power. Shoulders, held to fine tolerances, are concentric with heads and threads for uniformly accurate fit. The tough, resilient, *permanent* nylon locking pellet is integral with the threaded section.

All standard UNBRAKO socket screw products are available with or without the Nylok self-locking device. Authorized industrial distributors stock them. Write us for catalog and technical data on the complete line. Unbrako Socket Screw Division, STANDARD PRESSED STEEL CO., Jenkintown 37, Pa.

*T.M. Reg. U.S. Pat. Off., The Nylok Corporation

UNBRAKO SOCKET SCREW DIVISION

STANDARD PRESSED STEEL CO.

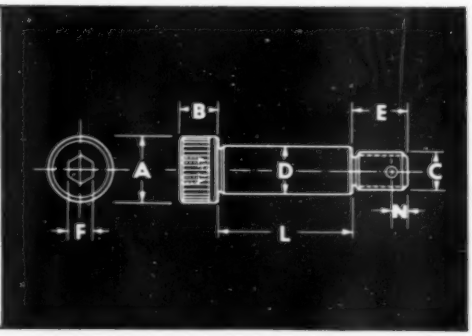
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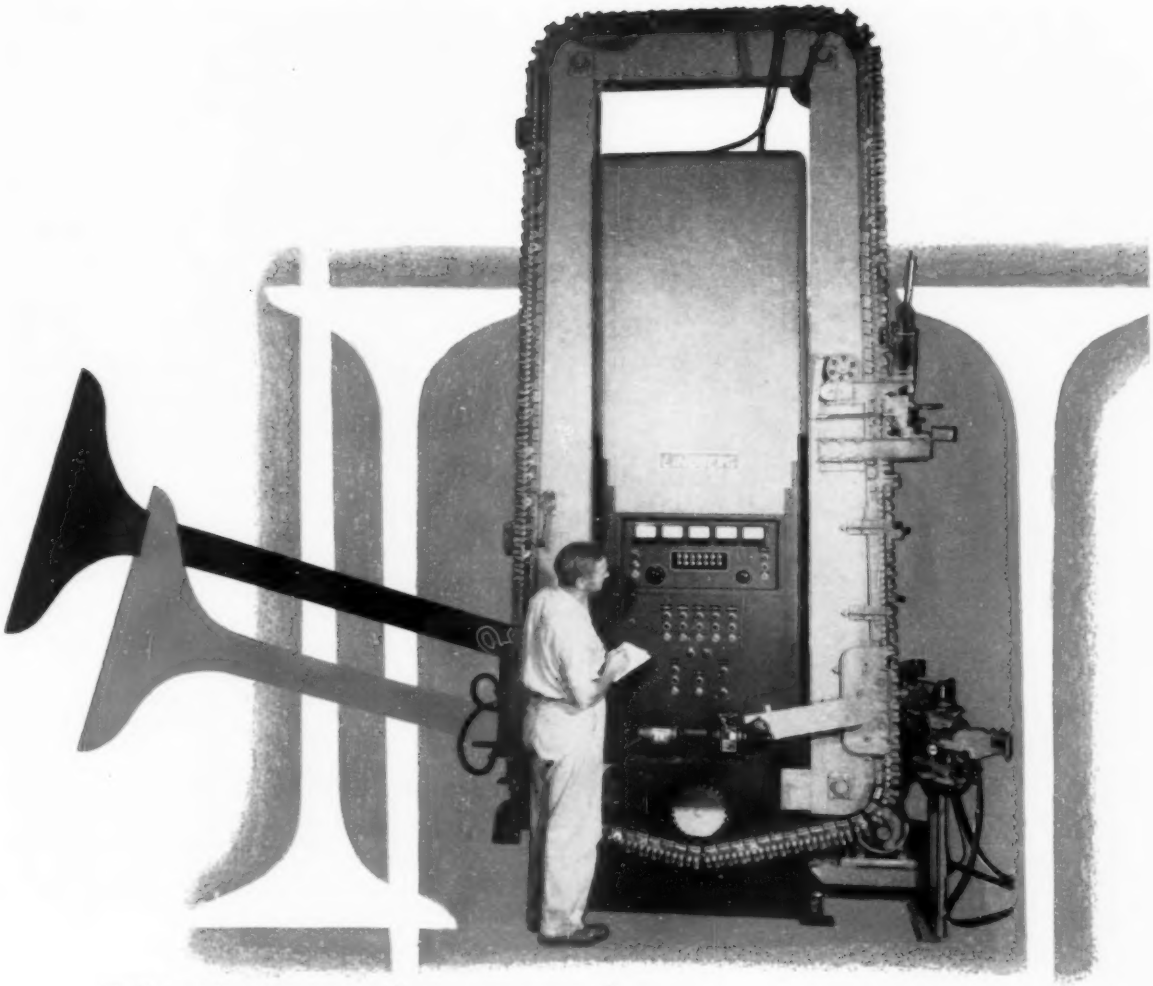
JENKINTOWN PENNSYLVANIA

We also manufacture precision titanium fasteners. Write for free booklet.

SPECIFICATION DRAWING. UNBRAKO stripper bolts are available with standard shoulder lengths ranging from ⅜ to 6 in.

D	Shoulder Diameter*		¼	5/16	⅜	½	⅝	¾
C	Thread Diameter UNC		10—24	¼—20	5/16—18	⅜—16	½—13	⅝—11
E	Thread Length		⅜	7/16	½	⅝	¾	⅞
A	Head Diameter		⅜	7/16	9/16	¾	⅞	1
B	Head Height		3/16	7/32	¼	5/16	⅜	½
F	Size of Hex. Hole		⅛	5/32	3/16	¼	5/16	⅜
N	Pellet Location		.141	.172	.187	.203	.234	.281
	*Shoulder Diameter Tolerances	Max.	.249	.3115	.374	.499	.624	.749
		Min.	.248	.3105	.373	.498	.623	.748





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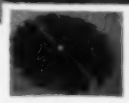
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Below: Heinemann Saw before and after Brightboy polish.

Left: Before; Right: After





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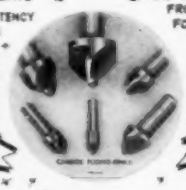
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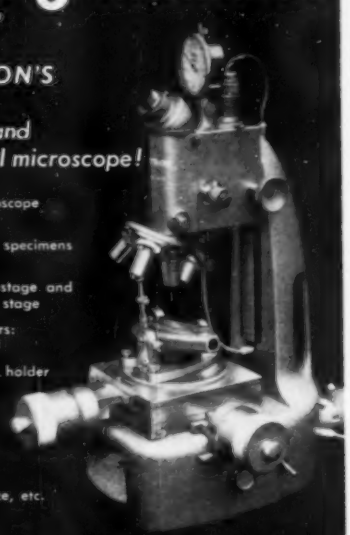
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ROBERT S. STEVENSON

Portrait by Fabian Bachrach

"At Allis-Chalmers we believe that we can do our fellow-employees no greater favor than to recommend that they invest in a 'nest-egg' fund of U.S. Savings Bonds.

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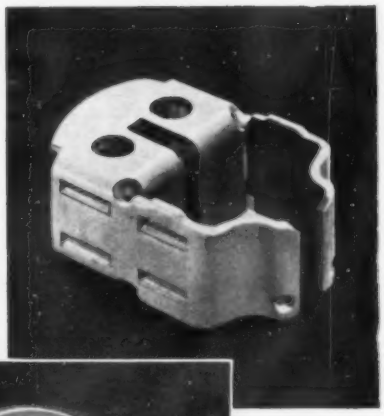
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TODAY—PAYROLL SAVINGS ENROLLMENT IS AT A NEW PEACETIME PEAK!

ON JOBS LIKE THIS CORBIN TURNS TO

U.S. MULTI-SLIDES®





The Corbin ball bearing latch bolt retractor is just one of a multitude of stampings which can be produced — complete, without secondary operations, handlings or inspections — on U. S. Multi-Slide Machines. In the U. S. Multi-Slide, a combination of motions built into the machine itself greatly simplifies the designing of tools to fabricate precision formed metal stampings. Because these motions are part of the standard machine equipment, it is not necessary to incorporate complicated movements into the dies. Standard equipment on the machine includes: ram action for cutting, piercing, trimming, embossing, etc.; a four-slide forming position; and vertical movement for stripping and transferring. U. S. Multi-Slide Machines are built in four sizes, and on the three larger units it is possible to use two or more rams simultaneously. These features make the U. S. Multi-Slide extremely versatile in the automatic, high-speed production of all types of formed metal stampings.

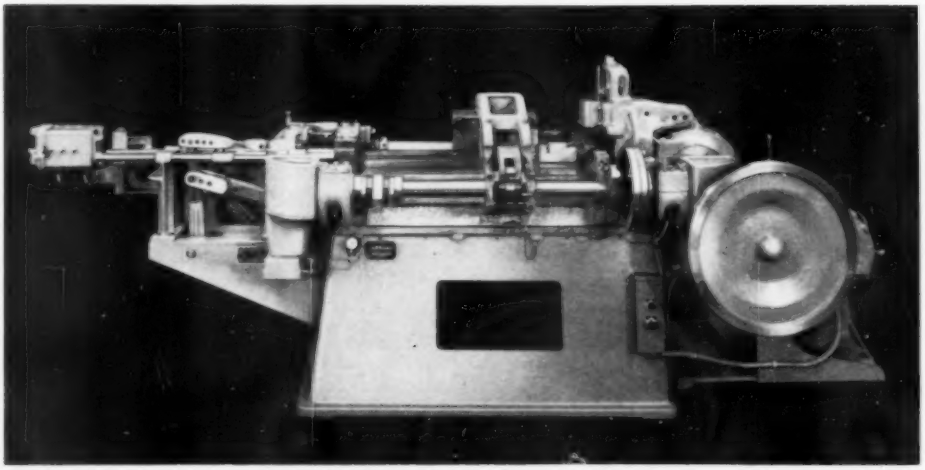
If you want to produce parts uniformly . . . at high speeds . . . and to close tolerances, write for a copy of Bulletin 15-T, or send part drawings or samples for our recommendations.

The Corbin Latch Bolt Retractor shown above illustrates the unique ability of the U. S. Multi-Slide to produce thousands of uniformly precise parts — faster and better. Completely formed to close tolerances from strip metal, this part is non-jamming, self-aligning and practically indestructible. Thus, it imparts to Corbin Locksets the famous "velvet glide" knob action, long life and trouble free service — qualities which were found previously only in higher priced custom units, but which are now, thanks to U. S. Multi-Slides, an integral part of every Corbin Standard Duty Residential Lockset.

U. S. TOOL COMPANY, Inc.

AMPERE (East Orange) **NEW JERSEY**

Builders of U. S. Multi-Slides — U. S. Multi-Millers
U. S. Automatic Press Room Equipment — U. S. Die Sets and Accessories



Left: The U. S. No. 35 Multi-Slide Machine used, with appropriate tooling, to produce the Corbin Latch Bolt Retractor shown above.

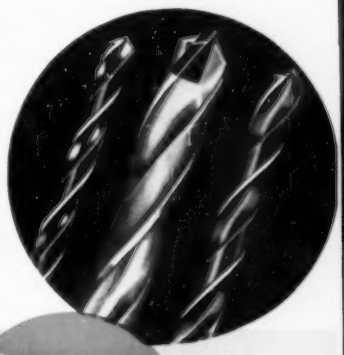


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Chicago-Latrobe is proud to be a regular supplier of drills and reamers to this quality conscious company. Throughout the Caterpillar plants, Chicago-Latrobe products are doing their part to help produce finer machines.

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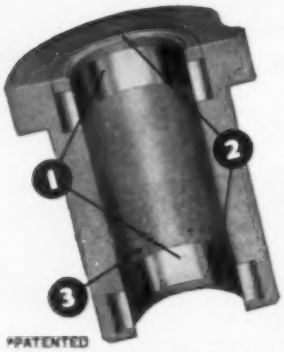
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1. Tungsten carbide rings at the points of wear; 2. Steel rings protect drills and carbide; 3. Special hardened alloy steel body.

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F32-I-O	0- 32 inch ounces
F80-I-O	0- 80 inch ounces
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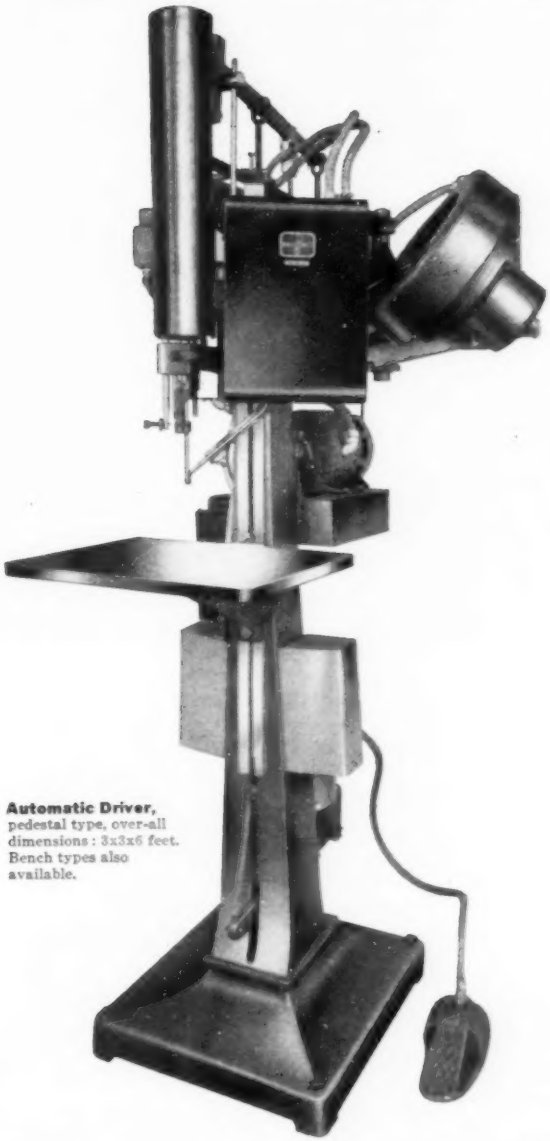
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NOW... automatically apply standard socket set screws, *speed small parts assembly*



Automatic Driver, pedestal type, over-all dimensions: 3x3x6 feet. Bench types also available.

Fastest way to insert and drive standard Bristol socket set screws

Your operator never touches a single set screw; but, with the Bristol Automatic Feeder and Driver, screws are inserted and driven at an average rate of 1800* per hour!

Just load hopper with socket set screws. Automatically they're positioned correctly and fed to the bit of the power screwdriver. Then they're inserted in tapped hole and tightened to predetermined torque or depth setting.

That, in brief, is how the revolutionary Bristol Automatic Feeder and Driver works. Check over these advantages:

FAST PRODUCTION. Brings automation, speed and economy to assembly of set-screw fastened parts like pulleys, impellers, fan blades, knobs, collars, gear sprockets, bearings, cams, dogs, couplings and cranks.

NO SPECIAL SCREWS REQUIRED. Works perfectly with standard Bristol socket set screws. Hex or Multiple-Spline socket; cup, flat, oval, cone or half-dog point.

UNIFORM TORQUE SETTINGS. Drives all screws to same preset depth or torque. Depth or torque settings easily adjusted as required.

REDUCED OPERATOR FATIGUE. Tedious individual handling of screws is completely eliminated; particularly desirable with smaller screw sizes.

ELIMINATES CROSS-THREADING.
STOPS FLOOR LOSS OF SCREWS.
REDUCES FLOOR AREA REQUIRED FOR ASSEMBLY.

And that's not all: Time-conscious production men will like the speed with which the Bristol Automatic Feeder and Driver can be changed over to handle different sizes of screws. (Adjustments for a screw length change take only about 5 minutes. A screw diameter change requires between 20 and 30 minutes.)

Get complete data on this outstanding mass production tool today. Write to the Application Engineering Department, Socket Screw Division, at the address below. A7.10

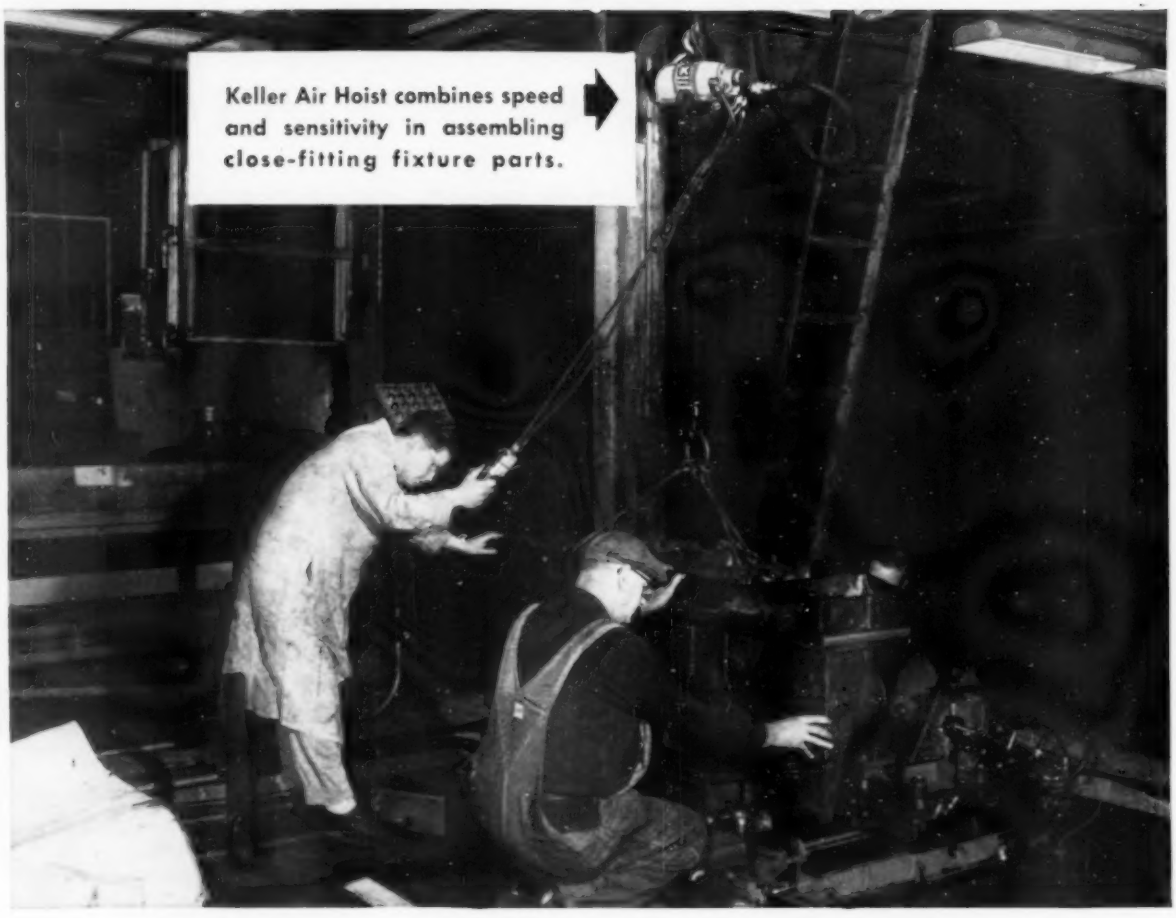
* *Assembly speed varies with factors such as time required to present parts, screw thread pitch, length of screw, and depth of insertion.*

Precision socket screw manufacturers since 1913



*Made in sizes as small as No. 0 in Alloy Steel and Stainless Steel. Cap screws up to 1½" diameter.

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Put It Together Fast with a Keller Air Hoist

You can save time and muscle power in assembling machinery or fixtures by using a Keller 86-IVI0 air hoist. Weighing only 28 lb., but containing an extremely powerful axial-piston air motor, this compact little hoist handles loads up to 1000 lb.—lifts or lowers as quickly or as slowly as you wish. This variable speed—which can be reduced to a slow creep—enables you to position parts carefully, without marring or scratching finishes. Send now for bulletin describing these handy hoists.



Keller "Hoistractor," a power trolley for I-beam track, gives you power to move the load as well as hoist it.

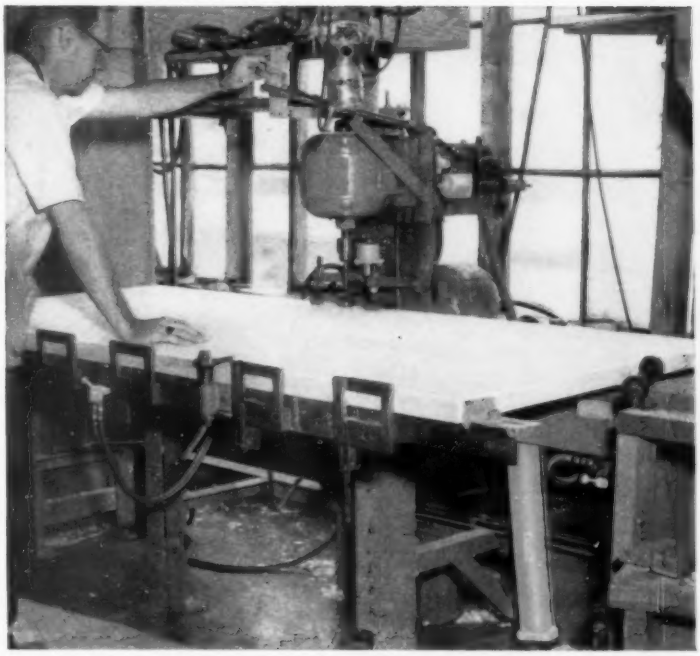
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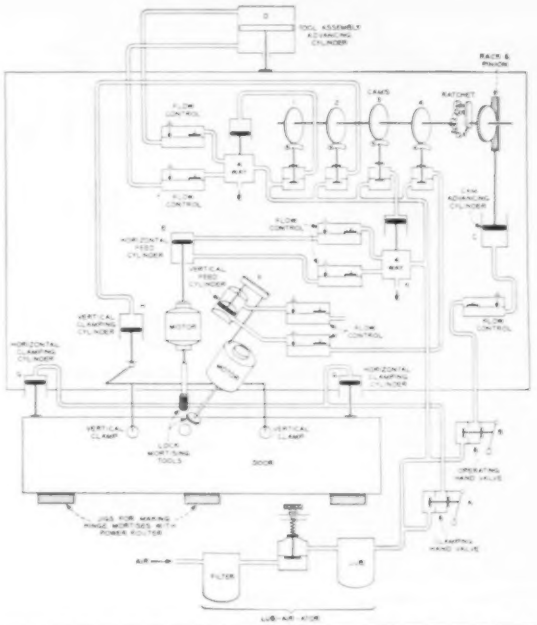
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Here's an example:

At a prominent Western woodworking company, Schrader Air Products are used on the door-mortising machine to clamp work in place, advance programming cam, and actuate all tool feeds. The machines work with extreme precision and the speed and economy of the operation are spectacular.

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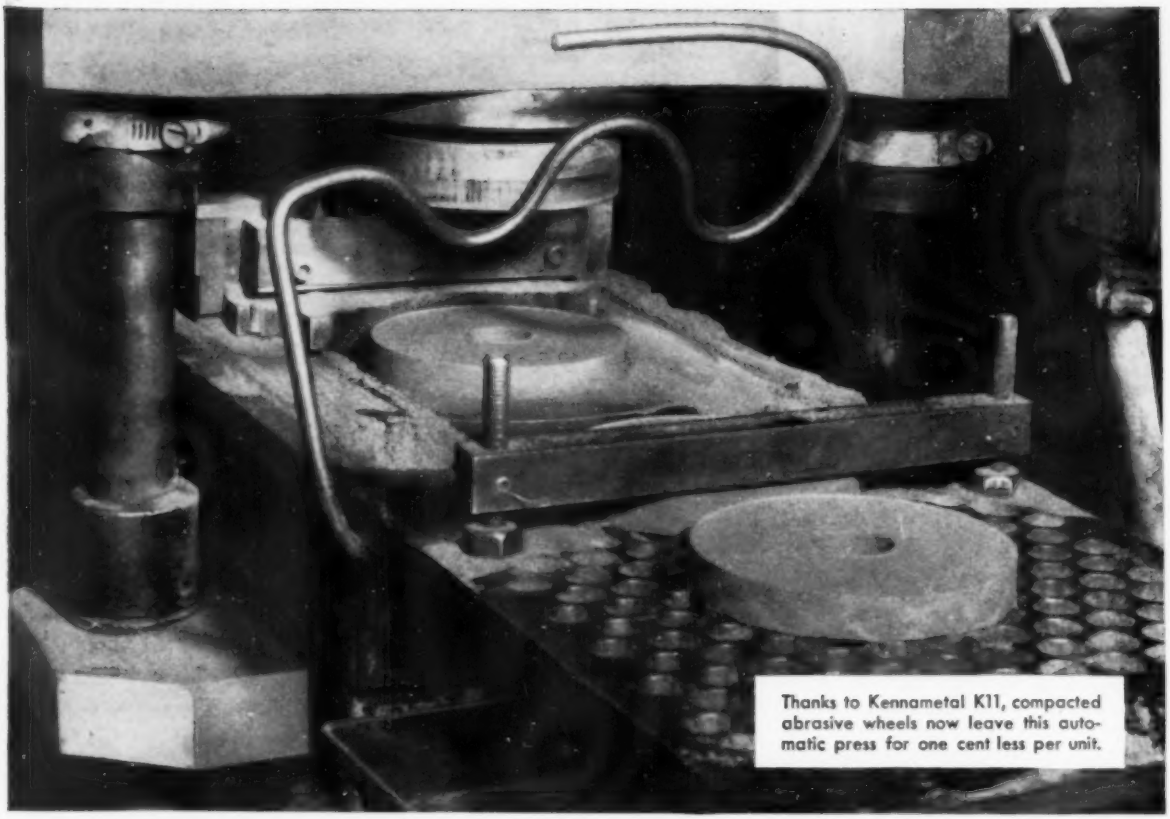
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With KENNAMETAL'S* Grade K11...

a penny saved every time the die is opened

In an effort to reduce the unit cost of compacted abrasive wheels, The Carborundum Company searched for a die material that would better withstand the unusually severe wear to which the dies are subjected. Experiments with Kennametal Die Grade K11 indicated great savings could be made . . . and later production records have proved it. Dies now last twice as long as previous carbide dies . . . and five to ten times longer than those made from high-carbon, high-chrome steel. From an average cost of 1.4 cents for the high-carbon high-chrome steel dies, unit cost has now dropped to .4 cents using Kennametal Grade K11.

In addition to reducing your unit costs through extended die life and low maintenance, Kennametal Die Grades bring you additional benefits through their ability to hold close tolerances for greater product uniformity.

Get more information on the six grades of Kennametal's "90" series or the three exclusive, non-galling "80" series . . . a total of nine Die Grades developed to meet every die need, including yours.

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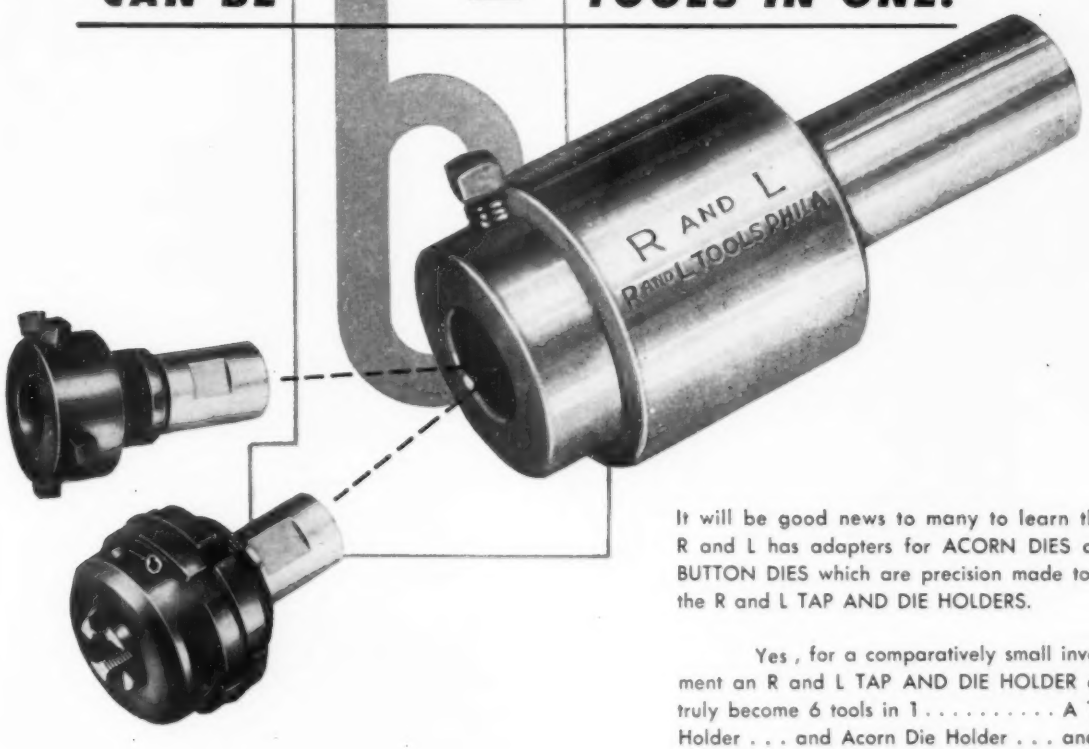
Upper and lower halves of the die for compacting abrasive wheels from silicon carbide grit. Hard-working punch on the right and the mold or "liner" shown in center are now made from Kennametal.

Why not find out what Kennametal can do for the critical wear parts of your operation? Consult your die supplier, your Kennametal Die Engineer, or write: KENNAMETAL INC., Latrobe, Pennsylvania.

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CAN BE 6 TOOLS IN ONE!



It will be good news to many to learn that R and L has adapters for ACORN DIES and BUTTON DIES which are precision made to fit the R and L TAP AND DIE HOLDERS.

Yes, for a comparatively small investment an R and L TAP AND DIE HOLDER can truly become 6 tools in 1 . . . . . A Tap Holder . . . and Acorn Die Holder . . . and a Button Die Holder . . . *For right and left hand threading* and tapping.

LEST YOU FORGET . . .

. . . The R and L TAP AND DIE HOLDER has an entirely new releasing mechanism, and can readily be changed for right or left hand threading and tapping. No spring plungers to wear or break. No small screws to work loose.

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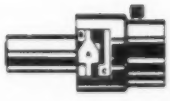


Figure 1.
Ready to start threading operation, clutch slightly engaged at C.

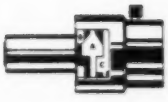


Figure 2.
Instantly engaged to full contact between A and C as soon as tap or die engages work.

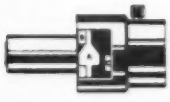


Figure 3
Fully released showing ample clearance between contact points of clutch preventing re-engagement or hammering of clutch points in case turret advances slightly after clutch releases.

• By substituting a shorter clutch ring retaining nut this tool can be readily changed for cutting extra short threads.

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1825 BRISTOL STREET • PHILADELPHIA 40, PA.

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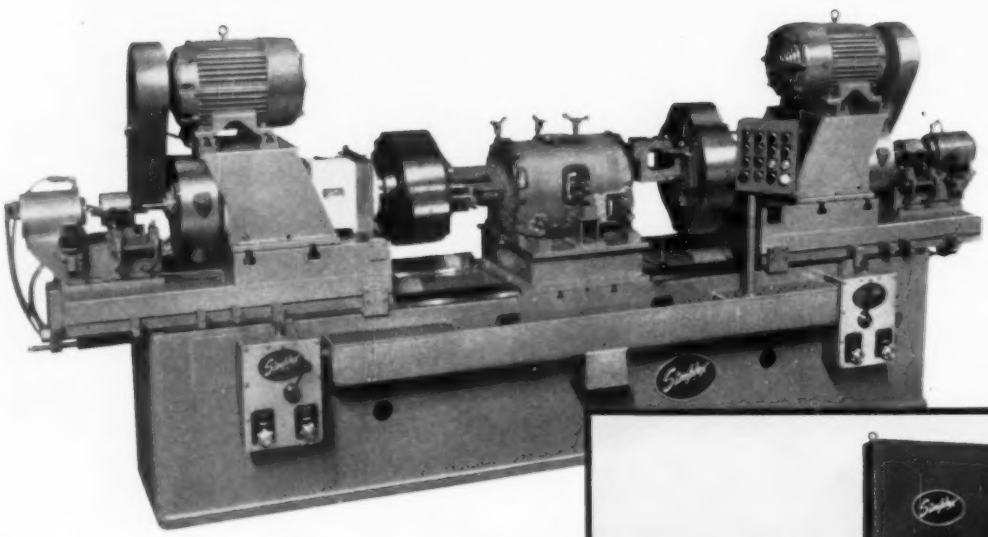
R and L TOOLS
1825 BRISTOL ST., PHILADELPHIA 40, PA.

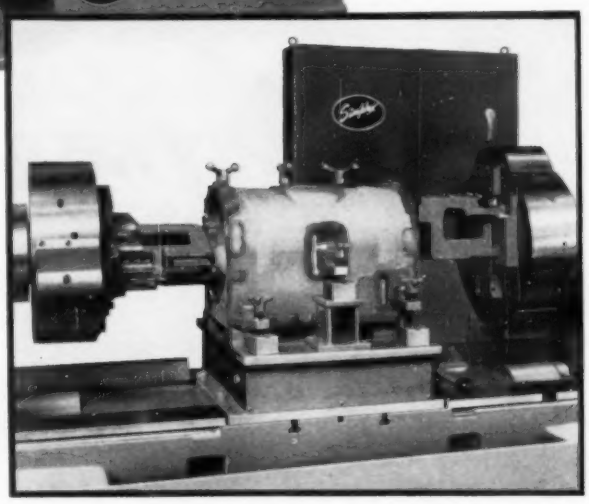
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SIMPLEX 4U 2-WAY UNIT TYPE HYDRAULIC FEED PRECISION BORING MACHINE complete with two #5 SIMPLEX self-lubricated ball bearing precision boring heads mounting a gear reduction unit, hydraulic feed-out mechanism and a 20" O.D. feed-out facing head with 4" stroke. Fixture is manually clamped and designed to permit rear clamps to be operated from front.

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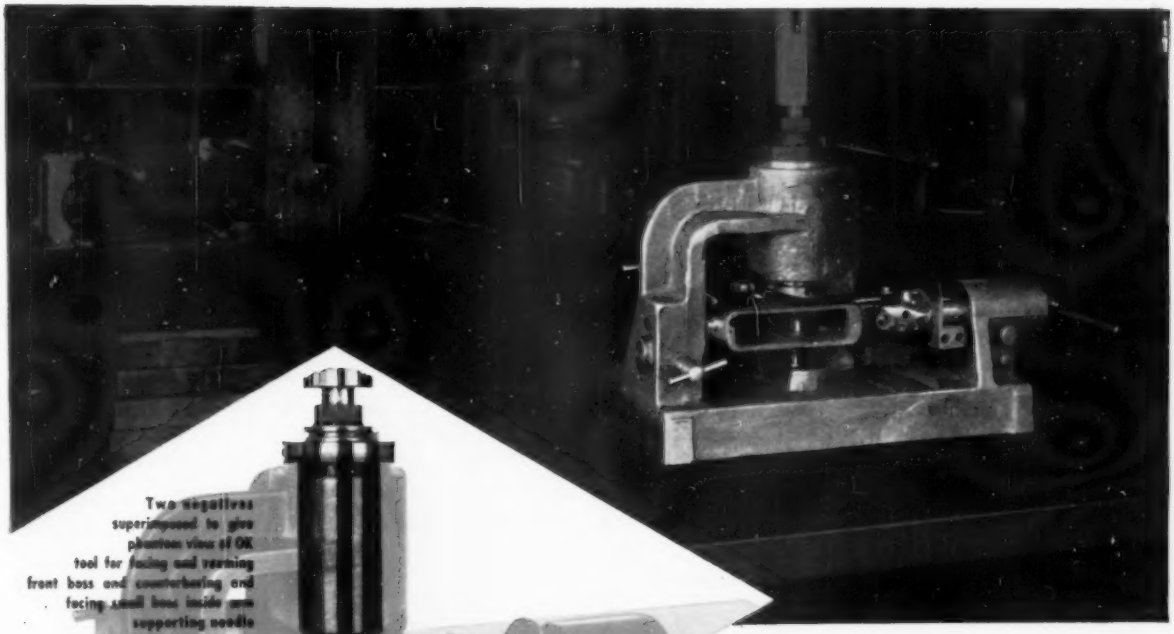
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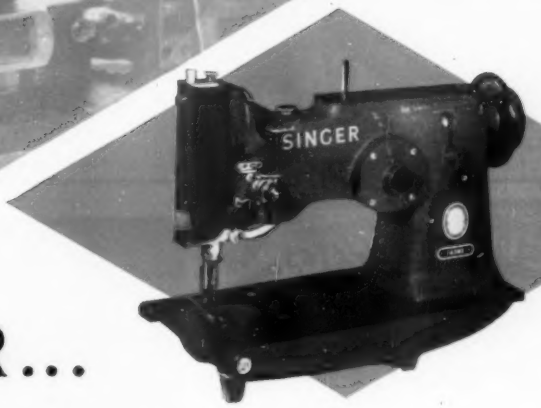
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SPECIAL DRILLING, TAPPING AND BORING MACHINES

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Two negatives superimposed to give phantom view of OK tool for facing and reaming front boss and counterboring and facing small boss inside arm supporting needle vibrating mechanism. Note husky character of pilot guide that holds tool straight and true.



Singer Sewing Machines, Class 143W, are used in industry for over stitching coat pads, binding awnings, finishing elastic knit goods and foundation garments, shoe linings, window shades and attaching lace, applique, flag stars, etc.

at SINGER...

four operations with one stroke...

JOB DATA

Operating speed ... 145 rpm

Feed ... .013 feet per revolution

Depth of cut ... facing, 3/32" reaming, 3/8"

Before Singer acquired these OK two-step piloted reaming and facing tools, downtime ran high. After 300 pieces, tools were out for grinding. Now they get 750 pieces before grinding, an increase of 150 per cent. One man works two spindles, producing 50 units per hour without pushing and maintains tolerances plus and minus .001". Workpiece is a sand molded grey iron casting, not the easiest material to machine. This is one of dozens and dozens of high speed steel and carbide bladed multiple-diameter tools OK has made for Singer. OK tool designing and engineering service is free and it's fast. If you have a tooling problem, why not talk to us about it. Just send us a blueprint, sample or picture with information as to the material, quantities, machines and horsepower available. In a week you will receive a print for approval and in another two weeks the actual tool will be making chips fly.

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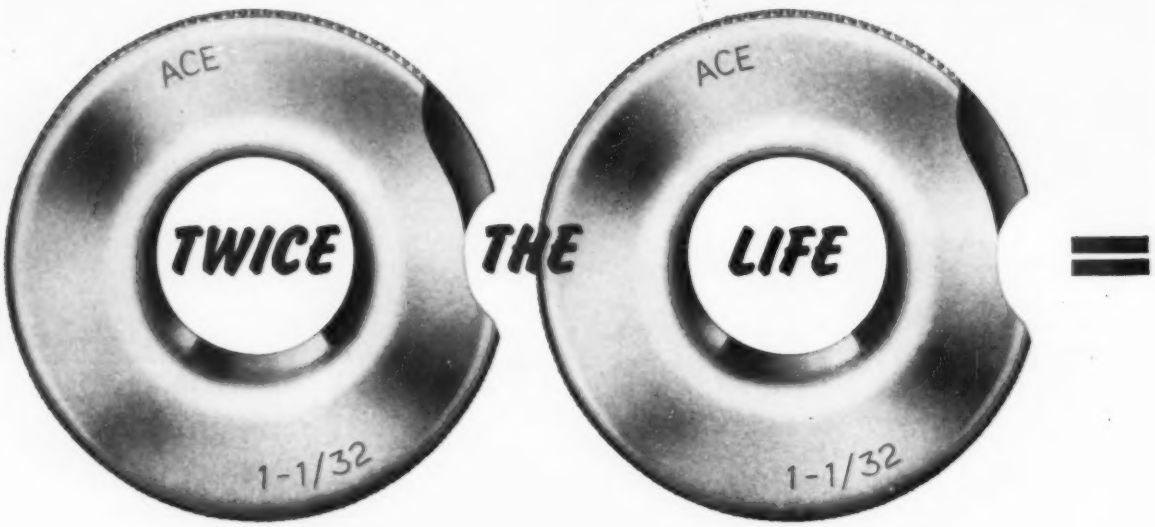
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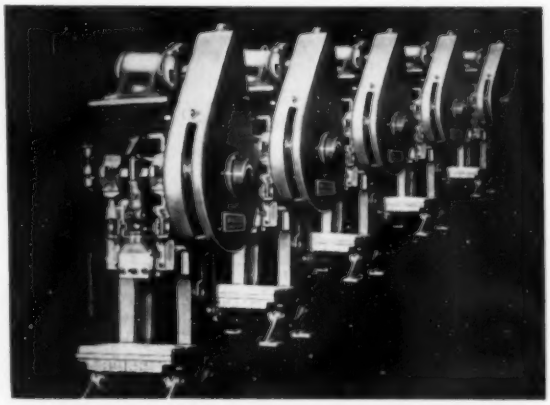
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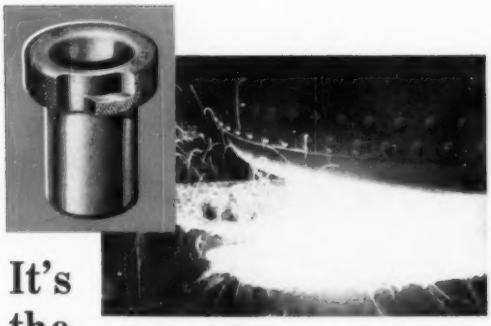
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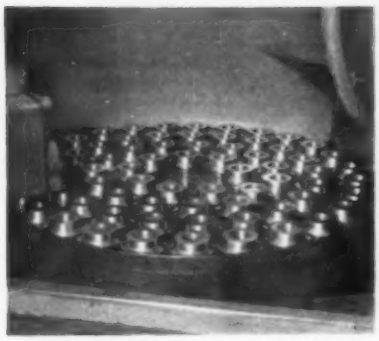
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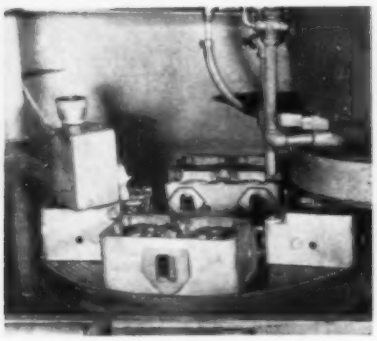
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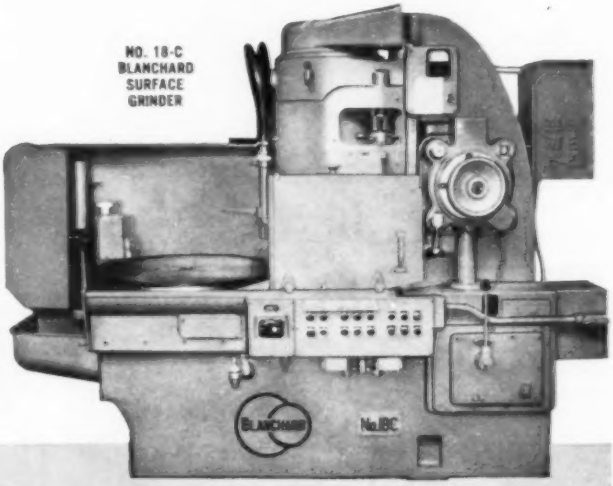
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Changes to fine feed just before finished size is reached

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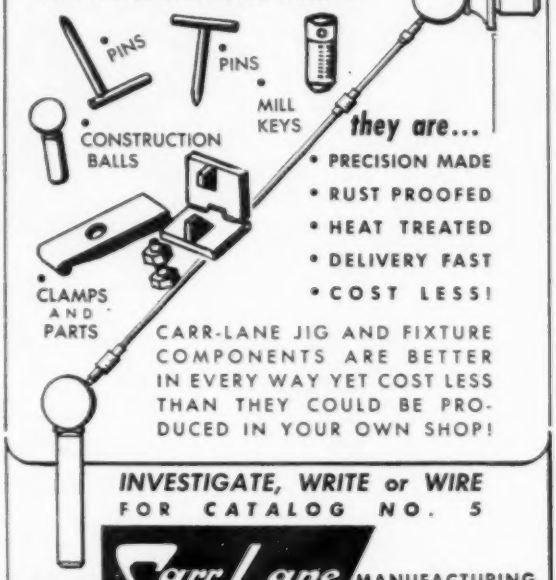
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Profitable. Sheldon Lathes are the right size for most toolroom and production jobs. Low in initial cost, they are inexpensive to operate and are profitable to use. It's just good business to be equipped with Sheldon Lathes.



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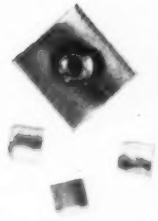
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PROGRESS REPORT OF TYPICAL SCREW PRODUCTS CO....



"ALMCO barrel finishing speeds deburring, saves labor costs, stimulates new business!"

Executive of screw products company points to paint scraper nuts and coupler jaws finished with Almco machines and methods.



Paint scraper nut (above)
Grease gun coupler jaws (below)

FAST, EFFICIENT FINISHING ON EVERY JOB! That's the guarantee at one hustling Midwest firm where Almco equipment has replaced hand methods. Now this job shop benefits four ways with this modern finishing method.

Parts are deburred faster and better . . . finishing costs are slashed . . . customers get swift, satisfactory service . . . parts too small for manual methods can now be profitably finished!

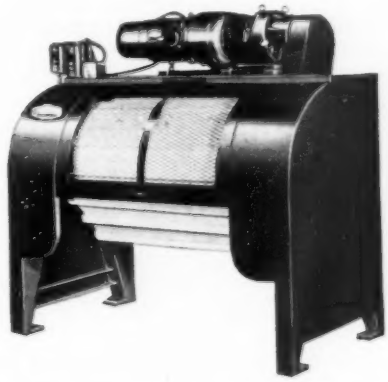
HERE ARE TYPICAL EXAMPLES:

This shop formerly handled only 3600 paint scraper nuts a day by belt sanding, a method that left many burrs. Now 64,000 nuts may be deburred daily with Almco equipment. Savings total 97.3% over former methods, all burrs are smoothly removed.

- Grease gun coupler jaws (¼" x ⅜") could not be finished manually because of small size. Now up to 40,000 are deburred in 10 hours with Almco equipment . . . up to 300,000 jaws are finished each year.
- Heavy burrs on push button switches could not be readily removed without barrel finishing. Now up to 10,000 per hour, 1,200,000 a year can be finished with Almco equipment. Finishing costs total less than $192 per million buttons!

GET FREE SAMPLE PROCESSING

Whether you have a job shop or a plant finishing department, find out what Almco barrel finishing can do for you. Almco's technical staff will examine your product parts, run them through detailed sample processing to determine your specific needs. You'll get a detailed report with recommendations without any obligation. Send in your sample parts with specification requirements.



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The DB-400 is a medium capacity machine with a standard barrel size of 30" x 48". This model is very effectively applied to the high production deburring and finishing of stampings, machined parts, smaller forgings and castings. Barrels with 1 to 4 compartments can be furnished.

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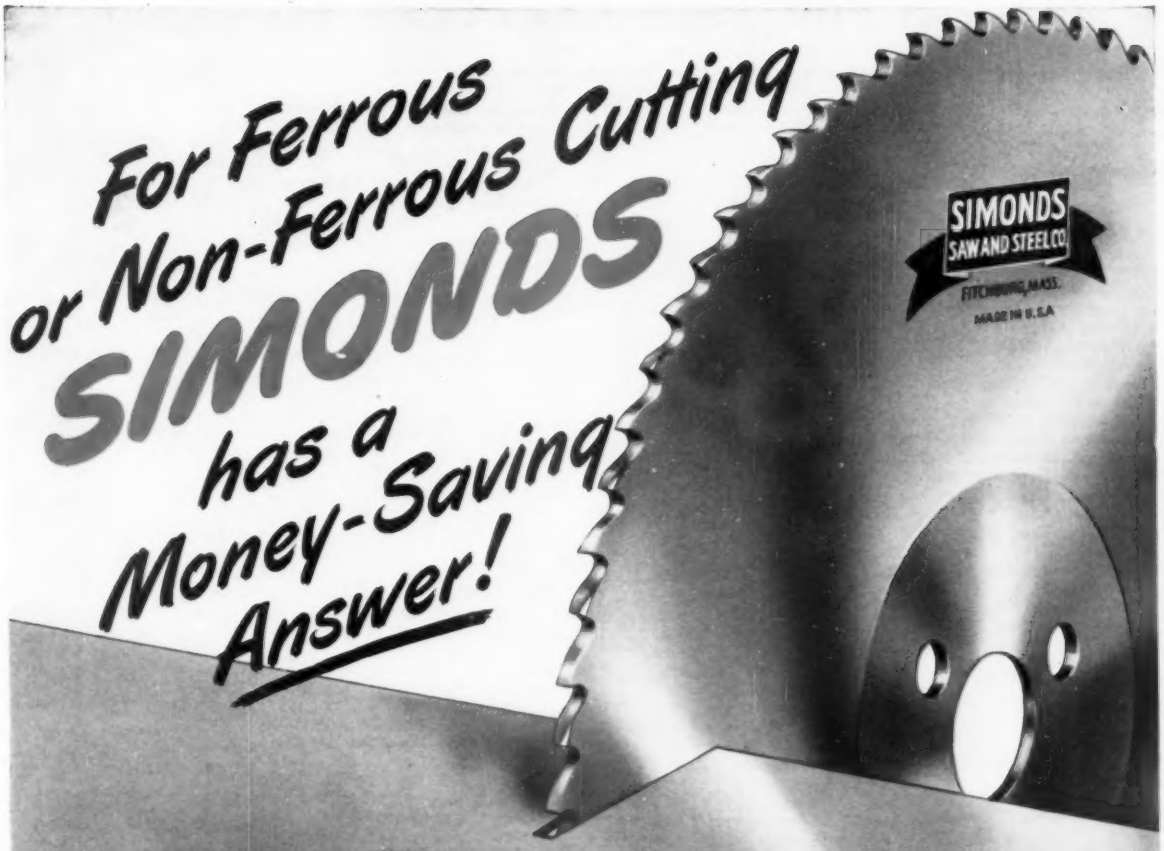
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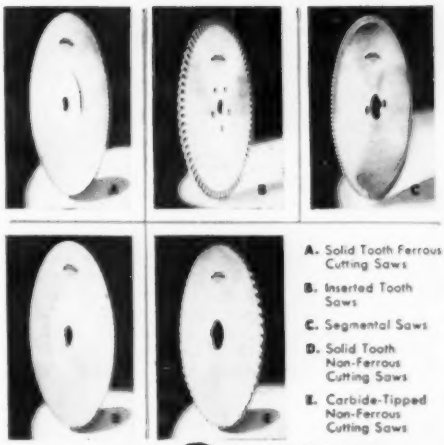
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January 1958

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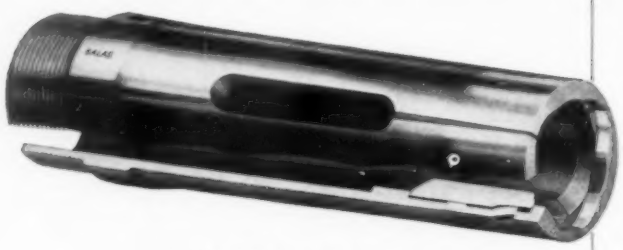
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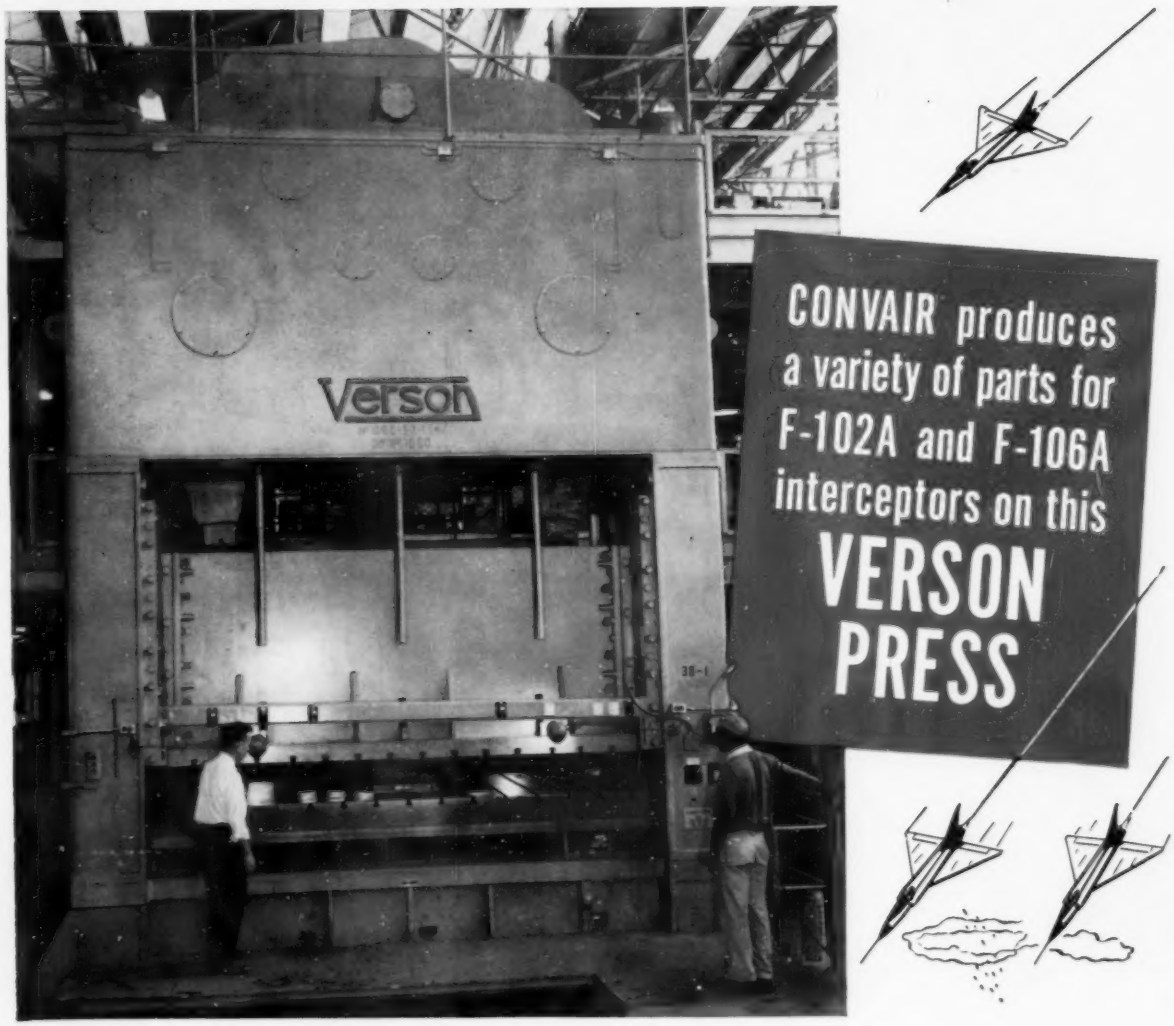
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